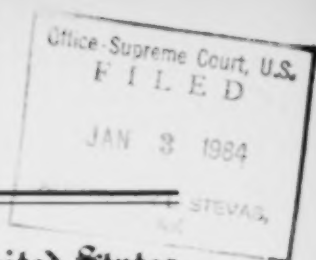


88-1087

No. \_\_\_\_\_



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**In the Supreme Court of the United States**

OCTOBER TERM, 1983

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**BOBBY C. CAMPBELL**

Petitioner

v.

**COAL PROCESSING EQUIPMENT, INC.,**

Respondent

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**On Writ of Certiorari to the United States  
Court of Appeals for the Sixth Circuit**

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**PETITION FOR CERTIORARI**

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## QUESTIONS PRESENTED FOR REVIEW

1. Does "Public Policy require the Federal Courts to go out of their way to hold patents invalid?

2. Are the rights of American inventors to charge others with infringement being unduly chilled by the threat of massive counterclaim damages parading under the guise of Unfair Competition.

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**PETITION FOR CERTIORARI**

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**A. THE DECISIONS BELOW**

The decisions whose review is sought herein include, first of all, the decisions of the United States Court of Appeals for the Sixth Circuit, styled *Coal Processing Equipment, Inc. v. Bobby C. Campbell*, Appeal Nos. 81-3629 & 82-3069. The initial decision (unpublished) of the Sixth Circuit Court of Appeals was entered on July 19, 1983, and involved the adoption (without separate opinion) of the opinion of the District Court. The Sixth

Circuit's decision (also unpublished) on petition for rehearing, filed on September 28, 1983, denied the petition for rehearing. Since the decisions of the Sixth Circuit Court of Appeals merely involve the affirmance of the District Court, the substantive decision whose review is sought herein is the decision of the Honorable Senior United States District Judge David S. Porter of the United States District Court for the Southern District of Ohio, Western Division, in the case styled *Coal Processing Equipment, Inc. v. Bobby C. Campbell*, Civil Action No. C-1-78-161. The Opinion of Judge Porter was filed on August 7, 1981, together with an Order consistent therewith. The Judgment was filed on August 10, 1981. The Opinion of Judge Porter is reported at 211 USPQ 986; there is no corresponding report in the Federal Supplement.

## **B. SUPREME COURT JURISDICTION**

As stated under Part A, supra, the decision of the Sixth Circuit Court of Appeals was entered on July 19, 1983. The denial of the petition for rehearing was entered on September 28, 1983. The Judgment of the District Court (which was adopted by the Sixth Circuit) was entered on August 10, 1981. By Order dated December 25, 1983, granted by Justice O'Connor, the time within which to petition for certiorari was extended to January 3, 1984.

Jurisdiction to review the decisions of the Court of Appeals for the Sixth Circuit is conferred upon the Supreme Court by Title 28 U.S.C., §§1254 and 2101.

## **C. STATUTES INVOLVED**

This petition involves a consideration of Title 35 U.S.C., §§112 and 282. The pertinent portions of these statutes read as follows:

### **§112. Specification**

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as

to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor of carrying out his invention.

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

#### **§282 Presumption of validity; defenses**

A patent shall be presumed valid. Each claim of a patent (whether in independent, dependent, or multiple dependent form) shall be presumed valid independently of the validity of other claims; dependent or multiple dependent claims shall be presumed valid even though dependent upon an invalid claim. The burden of establishing invalidity of a patent or any claim thereof shall rest on the party asserting such invalidity.

The following shall be defenses in any action involving the validity or infringement of a patent and shall be pleaded:

- (1) Noninfringement, absence of liability for infringement or unforceability.
- (2) Invalidity of the patent or any claim in suit on any ground specified in part II of this title as a condition for patentability.
- (3) Invalidity of the patent or any claim in suit for failure to comply with any requirement of sections 112 or 251 of this title,
- (4) Any other fact or act made a defense by this title.

### **D. STATEMENT OF THE CASE**

#### **1. Filing in the District Court**

On March 24, 1978, Coal Processing Equipment, Inc., ("CPE") filed suit against Bobby C. Campbell ("Campbell" or "Dr. Campbell") under the Federal Declaratory Judgment Act, Title 28, United States Code, §2201 requesting that the Federal

District Court hold that a certain Larry Gay Patent No. 3,926,787 be held non-infringed and invalid. At the same time, CPE asked that the Court find Campbell guilty of unfair competition for sending letters of infringement to the Plaintiff, the Plaintiff's customers and prospective customers. Subject matter jurisdiction was predicated on Title 28, United States Code, §§1338 (a) and (b). Personal jurisdiction was not contested.

## **2. Background**

The Larry Gay patent, owned by Campbell, involves a method and apparatus for the recovery of coal from a solid particulate mixture containing coal and impurities. The basic components employed in the method and apparatus are: (1) a mixing or slurry tank, (2) a cyclone separator, (3) a pump to convey a solids-water mixture or slurry from the mixing tank to the cyclone separator, and (4) the necessary piping to connect the pump between the mixing tank and the cyclone separator and to recycle water from the cyclone separator back to the mixing tank.

Mr. Gay did not invent a mixing tank broadly, nor did he invent a cyclone separator broadly; these he inherited from the prior experiments of others. What he did discover, in this prior combination, was that there was not sufficient agitation or turbulence in the mixing zone to permit a proper operation of the cyclone separator. Therefore, the inventor introduced additional agitation and/or turbulence into the mixing tank together with a recycling of water from the cyclone separator to permit a homogenous solids-water slurry to be fed to the cyclone separator and to keep a proper solids-water ratio in the system.

On January 20, 1978, Mr. Lawrence A. Johnson, co-counsel in the trial below for the Defendant, wrote a series of letters on Dr. Campbell's behalf. The letters, which were sent to CPE and to some of CPE's customers, advised them that they were infringing the Gay Patent in suit and called upon them to

cease and desist and to make an accounting for their income from the use of the patent. There were fourteen such letters sent. Except for the name and address of the recipient, the text of the letter was identical in each case and is repeated as follows:

**Gentlemen:**

**I represent Bobby C. Campbell who is the owner of U.S. Patent No. 3926787, "Method and Apparatus for Reducing Sulphur and Ash Content of Coal".**

**It has come to our attention that you are guilty of infringement of this patent in your business operations.**

**We call upon you to immediately cease and desist in this infringement and contact the undersigned immediately regarding an accounting as to your income from the use of this patent.**

**In the event you wish to discuss settlement of this controversy, please contact the undersigned. If you reject our claim, please advise in order that we may commence suit.**

**Very truly yours,**

**LAWRENCE A. JOHNSON**

Prior to sending out the letters of infringement, all dated January 20, 1978, Dr. Campbell was involved in extensive discussions and conferences with numerous people who were knowledgeable of the art and of CPE's activities therein.

### **3. The Trial in the District Court**

CPE presented considerable prior art testimony and evidence in the District Court to support its allegation of patent invalidity under 35 U.S.C. §103. However, the Court did not hold the patent invalid under 35 U.S.C. 103; rather, the Court held the patent invalid under 35 U.S.C. 112 for failure of the inventor to disclose the "best mode". No evidence of "best mode"

was offered by CPE in its case-in-chief. When the District Court held that the Gay Patent was invalid because Gay did not disclose the "best mode" contemplated by the inventor of carrying out his invention, this holding came as a complete surprise to Campbell, because this issue merely came about as a result of an off-chance remark by the inventor in discussing the totality of the elements in the mixing chamber.

In the Opinion of Judge Porter, the Court referred to:

Gay's failure to disclose the three pieces of metal pipe he used to minimize the swinging action of the hollow sleeve in the mixing chamber.

Also, in the Opinion, the Court erroneously stated:

Gay had installed the pipes in his mixing chamber prior to applying for the patent and *he considered them important* to the operation of the mixing chamber. (Emphasis added)

Gay first mentioned these three pipes or struts when he was asked by CPE's attorney to describe fully what was in the mixing tank. In answer to a question from Judge Porter, the inventor advised the Court that the three pieces of pipe had practically nothing to do with the operation of the system. On cross-examination, Gay stated that his best design, at the time he filed his patent application, had nothing to do with the three pipes.

On re-direct examination, the inventor was asked whether or not the three pipes or struts were disclosed in the patent. His answer was that they were not.

Then appeared a series of questions and answers:

- Q. When you provided your patent attorney with information for preparing the patent application, did you advise him of the existence of these struts?
- A. I don't think so, no.
- Q. Why did you not?



A. *I just guess I didn't consider them important enough. I just omitted them.* (Emphasis added)

In view of the above quoted testimony of the inventor, it should be obvious that Judge Porter was clearly in error when he stated that the inventor considered these three pipes *important*.

With regard to the issue of Unfair Competition, the testimony of the defendant, Dr. Bobby C. Campbell, was the significant testimony relied upon by the District Court. Dr. Campbell testified that he was involved in extensive discussions and conferences with numerous people prior to sending out the letters of infringement, all dated January 20, 1978. The first person who told Dr. Campbell about the possibility of infringement of the Gay Patent by CPE equipment was a certain Mr. Rozak. Campbell's conversation with Rozak took place in August or September of 1977. Dr. Campbell also spoke with a Mr. Reed, Mr. Gay, a Mr. Randy Deal, a Mr. Lynch and a Mr. Alpie. [The conversations with Lynch and Alpie led to the identity of the fourteen people to whom Campbell sent the notices of infringement, according to Dr. Campbell's testimony.]

Dr. Campbell testified that he first met Mr. Johnson (the attorney who wrote the letters of January 20, 1978) in person in Hamilton, Ohio, when Mr. Johnson flew into Hamilton and spent the night with Dr. Campbell and Mr. Reed at Dr. Campbell's house; this was in November of 1977. But Dr. Campbell had talked to Mr. Johnson previously over the telephone before this personal meeting. During these telephone conversations with Mr. Johnson, they discussed the question of infringement of the Gay Patent. The purpose of Mr. Johnson's visit to Hamilton, Ohio, was to speak with Dr. Campbell and Mr. Reed together to get as much input as possible regarding any infringement case they might have.

Dr. Campbell further testified that he and Mr. Reed went to the CPE plant. Mr. Reed went inside and made an inspection of the CPE equipment while Dr. Campbell remained outside in the automobile. Mr. Johnson was advised of Mr. Reed's inspection and the conclusion of Mr. Reed that the CPE equipment was almost identical to what they had.

After Mr. Reed went back to Oklahoma and he and Mr. Johnson had discussed the matter in more detail, Dr. Campbell authorized Mr. Johnson to send out the letters. According to Campbell's testimony, at the time he authorized Johnson to send the infringement letters, Campbell believed that the people to whom he was sending the letters were infringing the patent; this was also the opinion of his attorney.

Dr. Campbell testified that he was aware that Johnson, although not a registered patent attorney, had experience in the trial of patent cases. As far as Mr. Reed was concerned, Campbell stated that he was aware of the fact that Reed was an engineer and, also, that Reed had assisted the patent attorney in the prosecution of the Gay Patent.

With regard to the Damage issue, the District Court relied upon the testimony of John Richards and Walter T. McCartney, President and Vice-president, respectively, of CPE. Richards and McCartney both testified regarding the possible loss of business resulting from the letters of January 20, 1978. Neither witness could specifically identify any particular job that was lost as a result of the letters. Initially, Mr. Richards alleged that they lost two sales; one to a Richard Buddeke and the other to a George Martin. On cross examination, however, Mr. Richards admitted that neither Buddeke nor Martin ever received a letter from Mr. Johnson regarding infringement. Furthermore, Richards was unable to state that CPE ever lost a sale to Buddeke or Martin as a result of the letters in question. Mr.

Richards testified that CPE filed the instant lawsuit because *they were concerned about actual patent infringement.*

Mr. Richards alleged that the letters of January 20, 1978, affected the credit rating of CPE. However, he later admitted that this credit affect did not take place until after he returned from a coal show in Chicago in May of 1980, over two years after the sending of the Johnson letters. CPE did not avail itself of the Bankruptcy laws until 1980. With regard to the financial condition of CPE between 1978 and 1980, Mr. Richards admitted that the stock of one of CPE's original investors (a gentleman named Harry Fabe) was purchased in August of 1979 for \$500,000.00. McCartney testified that CPE was not experiencing any financial problems at the time Mr. Fabe's stock was purchased.

## E. ARGUMENT

### 1. QUESTION NO. 1 Does "Public Policy" Require the Federal Courts to Go Out of Their Way to Hold Patents Invalid?

The District Court was unable to find the patent in suit invalid in view of the prior art under 35 U.S.C. §103, so the Court strained to find invalidity under 35 U.S.C. §112 for failure to disclose the "best mode".

At a time when this country is suffering an ever narrowing technological gap with the foreign competition, it seems passing strange that our patent system, which is largely responsible for our preeminence in the worldwide industrial community, would be so lightly regarded.

Too much emphasis is placed on striking down patents in the name of "public policy". To be sure, there are times when the considerations of the public must override the maintenance of worthless or highly questionable patents. In the case of *Lear*,

*Inc. v. Adkins*, 395 US 653 (1969), the Supreme Court overruled the doctrine of licensee estoppel because of the important *public interest* in permitting full and free competition in the use of ideas which are in reality part of the public domain. In the landmark case of *Graham v. John Deere Co.*, 383 US 1 (1966), the Supreme Court noted:

. . . the underlying policy of the patent system that "the things which are worth to the public the embarrassment of an exclusive patent," as Jefferson put it, must outweigh the restrictive effect of the limited patent monopoly.

On the other hand, the facility with which our courts declare patents invalid is giving cause for concern in many quarters. In *Semantic Antics in Patent Cases*, 88 F.R.D. 103, 108, (1980), the Honorable Howard T. Markey (now Chief Judge of the Court of Appeals for the Federal Circuit) was commenting on the overzealous proclivity of the Federal Courts in holding patents invalid, and made the following remark:

"We declare the patent invalid in the public interest" (ignoring the equally important public interest in declaring valid patents valid).

It is generally recognized that over 50 percent of patents that are involved in litigation are declared invalid. Whereas no up-to-date figures appear to be available, the Patent and Trademark Office made a study of court determinations of patent invalidity covering the years 1973 to 1977 and compared the results with an earlier survey covering the years 1968 to 1972. The report is summarized in the *Official Gazette of the United States Patent and Trademark Office*, Vol. 989, Number 1, December 4, 1979, pages 2 and 3. The report shows that cases going through the Federal Courts of Appeals result in 70 percent of patents being declared invalid for the period of 1966 to 1972, and 69 percent for the period of 1973 to 1977.

In the present case, Judge Porter had absolutely no justification for holding the patent invalid under the guise or ruse that the inventor failed to disclose the "best mode." That just isn't so. Bearing in mind that the specific wording of 35 USC §112 calls upon the inventor "to set forth the best mode *contemplated by the inventor* of carrying out his invention" (Emphasis added), this inventor has testified that he didn't consider the three struts (the allegedly omitted items) even important enough to mention to his patent attorney. In effect, the above quoted portion of §112 is saying that the inventor "can not have his cake and eat it too." The latter sentiment is best expressed in the case of *In re Gay*, (CCPA 1962) 309 F.2d 768, where the Court of Customs and Patent Appeals interpreted the terminal portion of the above quoted paragraph of Title 35, USC §112, as follows:

Manifestly, the sole purpose of this latter requirement is to restrain inventors from applying for patents while at the same time concealing from the public preferred embodiments of their inventions which they have in fact conceived.

\* \* \*

Not every last detail is to be described, else patent specifications would turn into production specifications, which they were never intended to be. United States specifications have often been criticized as too cluttered with details to give an easy understanding of what the invention really is.

Campbell would call this Court's attention to one further decision regarding "best mode"; Campbell refers to the decision *In re Bosy*, (CCPA 1966) 360 F.2d 972. In the *Bosy* case, the CCPA stated:

Regarding the best mode requirement of 35 U.S.C. 112, this court has stated that "an inventor is in compliance therewith if he does not conceal what he feels is a preferred embodiment of his invention," and there is no statutory basis for reading into the best mode portion a requirement

"that the mode disclosed be in fact the *optimum* mode of carrying out the invention" in re Gay, supra, 50 CCPA at 731-32.

It is our view that the error of failing to "analyze exactly what appellant's invention is in the instant case," In re Gay, supra, 50 CCPA at 732, has resulted in the additional error of requiring a best mode be set forth of details not relating to the essence of the invention.

There was no evidence, or even a hint, that the three struts were necessary for the proper operation of Dr. Campbell's patent. According to 35 USC §282, a patent is presumed valid and the burden of establishing invalidity rests upon the party asserting invalidity. That burden was not carried in this case. Judge Porter apparently felt that he must hold the patent invalid because of some vague, ill-defined "public interest."

**2. QUESTION NO. 2 Are the Rights of American Inventors to Charge Others with Infringement Being Unduly Chilled by the Threat of Massive Counterclaim Damages Parading under the Guise of Unfair Competition?**

It is submitted that Dr. Campbell did what any prudent patent owner would do when he felt that his patent was being infringed. He made an investigation. He consulted an attorney. He sent notices of infringement to those parties who, in his opinion, were infringing the patent. Yet, after following all of these normal steps (as set forth in greater detail earlier herein), Campbell was nevertheless found guilty of Unfair Competition.

The District Court found that Dr. Campbell was guilty of Bad Faith, ignoring the fact that the burden of proving Bad Faith rested with CPE. The Court drew unfavorable inferences against Dr. Campbell for *his* failure to call certain witnesses to corroborate Campbell's testimony, again ignoring the burden of proof. All of the witnesses identified by Dr. Campbell as form-

ing a part of his investigation had been disclosed to CPE well over a year before the trial. CPE chose not to call these witnesses and/or interview them to determine if Dr. Campbell was telling the truth about their statements and their advice to him. It is further submitted that unfavorable inferences should be drawn against CPE for failure to call these witnesses, because the burden of establishing Bad Faith rested with CPE. Dr. Campbell testified that he honestly believed that the parties to whom he sent notices of infringement were infringing his patent at the time the notices were sent. This testimony remains uncontradicted.

Judge Porter found that a certain letter (sometimes referred to as the "pig" letter) written by Dr. Campbell in 1970 to Mr. McCartney was also evidence of Bad Faith. This "pig" letter related to a prior operation known as "Pennsylvucky Holding Company" in which both McCartney and Campbell were involved. The letter was written by Campbell to McCartney, who was president of Pennsylvucky, requesting that Campbell be issued certain shares of stock which had been promised to Campbell, and also requesting that Campbell be reimbursed for his expenses for the use of a pick-up truck provided by Campbell. The terminal portion of the "pig" letter made an indirect and humorous reference to a pig farm which Campbell owned.

The Court found that this "pig" letter (although written eight years prior to the letters of infringement) showed a harboring of animus towards McCartney over this long period of time. On the other hand, Campbell stated that no offense was meant by the "pig" letter, and McCartney testified that no offense was taken. This "pig" letter, by the way, was a surprise exhibit at trial. It had long been forgotten by Campbell and it had not been listed as a trial exhibit by CPE even though McCartney testified that he had called it to the attention of his attorney

months before the trial. If no offense had been taken by McCartney, why was this letter introduced as a surprise exhibit at trial?

The fourteen Johnson letters of infringement were sent out on January 20, 1978, and the lawsuit was filed by CPE on March 24, 1978, scarcely two months later. Yet, the District Court found Dr. Campbell guilty of Unfair Competition. Not only that, but the Court also found that the act of Unfair Competition resulted in damages to CPE as follows:

- (1) CPE's sales fell off precipitously after the Johnson letters were sent.
- (2) A number of potential customers have refused to purchase CPE plants until the infringement accusations were resolved.
- (3) Lines of credit with suppliers and banks were extinguished.
- (4) Most of CPE's employees have been laid off.
- (5) CPE petitioned for reorganization of its debts under Chapter II of the Bankruptcy Act in May, 1980.

What a price for a patent owner to pay for sending out notices of infringement in a normal, prudent manner!

But there was no evidence introduced to show that CPE's sales fell off precipitously or that most of their employees had been laid off. No witness could identify any particular job that was lost as a result of the letters. No witness could establish that the letters of January 20, 1978, affected the credit rating of CPE. In fact, the credit rating was not affected until after May of 1980, over two years after the sending of the Johnson letters. CPE did not avail itself of the Bankruptcy laws until 1980. With regard to the financial condition of CPE in 1979, McCartney testified that CPE was not experiencing any financial problems at that time.



Even if it could be established that Campbell was guilty of Unfair Competition, there is still no evidence in the case that CPE suffered any damage as a result of Dr. Campbell's actions; in fact, there is really no evidence that CPE was damaged at all for any reason that remotely bears on the Gay Patent in suit.

Therefore, whatever financial problems CPE was experiencing appear to have occurred more than two years after the sending of the letters of infringement. There wasn't a shred of evidence introduced at trial which would link any of CPE's financial problems with the letters of January 20, 1978.

It has long been recognized that a patent owner has a right to send out notices of infringement to those whom the patent owner believes are infringing the claims of his patent. In *Virtue v. Creamery Package Mfg. Co.*, 227 U.S. 8, 33 S.Ct. 202, 208 (1913), the Supreme Court held:

Patents would be of little value if infringers of them could not be notified of the consequences of infringement, or proceeded against in the courts. Such action, considered by itself, cannot be said to be illegal.

In the case of *Bryan v. Sid W. Richardson, Inc.*, (CA 5 1958), 254 F.2d 191, the Court of Appeals for the Fifth Circuit commented on the sending of notices of infringement as follows:

A patentee has that right, *Robertson Rock Bit Co. v. Hughes Tool Co.*, 5 Cir., 176 F.2d 783, 785; *Gillman v. Stern*, 2 Cir., 114 F.2d 28, 32. Indeed, his ability to recover indemnity may date from it, 35 U.S.C.A. 287, *Livesay Window Company, Inc. v. Livesay Industries, Inc.*, 5 Cir., 251 F.2d 469. Moreover, this is a reasonable thing for businessmen to do since it is hardly to be thought that it is a sign of bad faith to warn friendly customers, present or potential, that if they purchase a competing infringing tool, litigation against them might be necessary. Nor does the

failure to sue the users thus warned give it a bad brand. If the patent exists, and is valid, as we have held, the warning is a legitimate sanction. A patent is to protect the patentee in his monopoly against the depredations of others. He may sue, but he need not, and if he sues, he may take after a user or the manufacturer or both. The infringing manufacturer cannot complain that the gage lay at his feet.

In the case of *Jenkel-Davidson Optical Co. v. Roberts Instrument Co.*, (E.D.Mo. 1963), 137 USPQ 644, the District Court stated at 137 USPQ as follows:

That a patentee may lawfully issue warnings to infringers of its patent is clear. *Virtue et al. v. Creamery Package Manufacturing Co., et al.*, (8 Cir. 1910) 179 F. 115 Aff'd. 227 U.S. 8, 33 S.Ct. 202. The only limitation on such right is the requirement of good faith, which carries with it the absence of express malice. *Kemart Corp. v. Printing Arts Research Laboratories*, (9 Cir. 1959) 269 F.2d 375, 122 USPQ 56. That the patentee is eventually found to be incorrect in his contentions of validity and infringement is of no importance so long as he honestly and reasonably believes that which he asserts. *Eastern States Petroleum Co. v. Asiatic Petroleum Corp.*, (2 Cir. 1939) 103 F.2d 315. *The burden of establishing bad faith is upon the party asserting it.* *Heuser v. Federal Trade Commission*, (7 Cir. 1925) 4 F.2d 632. (Emphasis added)

In the case of *Coats Loader & Stackers, Inc. v. Henderson*, (CA 6 1956), 233 F.2d 915, (a case which was seemingly ignored herein by Judge Porter and the Sixth Circuit Court of Appeals), the Court stated, in regard to the sending of notices of infringement to customers and prospective customers, that the following finding of the District Court was to be affirmed:

The defendants have not been guilty of unfair competition in notification to plaintiffs' exclusive agent and to plaintiffs' customers and prospective customers. Any such

notifications given by defendants were proper under the premises and given in good faith."

In the case of *Airtex Corp. v. Shelley Radiant Ceiling Co.*, (CA 7 1976), 536 F.2d 145, the Court of Appeals for the Seventh Circuit commented on the finding of the District Court that there was *nothing actionable in certain letters which were sent to 16 customers of the defendant* as follows:

We believe a further indication of its good faith is the fact that the notices were *selectively sent only to those architects, contractors, and others who were in fact considering the purchase of Shelley panels rather than an indiscriminate wholesale mailing of notices to anyone* who might be interested in radiant heating and cooling panels. (Emphasis added)

Although the burden of proof on the question of Bad Faith was on CPE, the District Court, nevertheless, drew inferences against Dr. Campbell for his failure to call certain witnesses in this action. In the Opinion (Page 47), the Court referred to 29 Am. Jur. 2d, Evidence §180. However, in the same volume of Am. Jur., §186, it is stated that no inference should be drawn if the witness' testimony would merely be corroborative or cumulative; the treatise goes on to say:

. . . a party is not bound to introduce every witness who might know anything about the matter in issue, at the risk of being burdened with an unfavorable inference because of his failure to do so. (29 Am. Jur. 2d, Evidence §186, Page 235).

Also in the same volume of Am. Jur., §187, it is stated that the rule on inferences should not serve to relieve the other party of the burden of proving his case (29 Am. Jur. 2d, Evidence, §187, Pages 235, 236).

### 3. NON-INFRINGEMENT

Because of the greater importance of the issues of invalidity

and unfair competition, the less important issue of infringement has not been mentioned heretofore. However, Campbell asserts that the decisions below are in error on this issue as well. Judge Porter held that there was no infringement because he refused to apply the doctrine of equivalents in this case stating:

Our conclusion regarding the application of the doctrine of equivalents in this case is strengthened by the policy within the law of giving broad protection from equivalents *only to pioneer patents*. (emphasis added, Opinion, page 28)

This holding is clearly contrary to the decision in *Continental Paper Bag Co. v. Eastern Paper Bag Co.*, 210 U.S. 405 (1908), where the United States Supreme Court held that the doctrine of equivalents may be invoked for other than pioneer patents.

## F. CONCLUSION

If the decision below is allowed to stand, it will serve as encouragement to the Federal Courts to declare patents invalid upon the slightest pretext. Furthermore, the holding on Unfair Competition, if not reversed, will discourage patent owners from asserting their rightful claims of infringement against those who would infringe. For the reasons briefly set forth above, it is believed that the holding of non-infringement should be reversed as well.

Respectfully submitted,

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## APPENDICES

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### APPENDIX A

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**APPENDIX A**

7/24/81

FILED  
JOHN D. LYTER, CLERK  
AUG 7 4 37 PM '81  
U.S. DISTRICT COURT  
SOUTHERN DIST. OHIO  
WEST DIV. CINCINNATI

**UNITED STATES DISTRICT COURT  
SOUTHERN DISTRICT OF OHIO  
WESTERN DIVISION  
No. C-1-78-161**

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**COAL PROCESSING EQUIPMENT, INC.,**  
Plaintiff

v.

**BOBBY C. CAMPBELL**  
Defendant

---

**OPINION**

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PORTER, S. J.:

**PROCEDURAL POSTURE**

This action concerns United States Patent No. 3,926,787 [the "Gay patent"], now owned by defendant Bobby C. Campbell. Plaintiff Coal Processing Equipment, Inc. ["CPE"] filed this action on March 24, 1978, asking in its complaint (doc.1) for a declaratory judgment that the Gay patent is invalid and un infringed, for damages on a claim of common law unfair competition, and for attorney fees pursuant to 35 U.S.C. § 285. Along with its complaint CPE filed a petition for a temporary order (doc. 2) enjoining Campbell from interfering with CPE's business activities, and from filing an infringement action based on the Gay patent. A consent order (doc. 3) enjoining Campbell from interfering with CPE's customer relations and from filing

a separate infringement action was filed April 7, 1978. On May 4, 1978 Campbell filed an answer denying the substance of CPE's complaint and entered a counterclaim alleging devices manufactured and sold by CPE infringed the Gay patent.

Subject matter jurisdiction for this action is predicated on 28 U.S.C. § 1338 (a) and (b). Personal jurisdiction is not contested.

In a pretrial order dated January 17, 1980 (doc 34) this Court directed that Campbell be given an opportunity to observe a CPE device in operation. In a pretrial order dated December 17, 1980 (doc. 48) this Court severed for later trial the issue of damages arising from any liability determination. The issues of infringement, validity, unfair competition, and attorney fee liability were tried to the Court on January 6, 7, 8, 21, 22, 23, and February 4, 5, 6, 11, 12, 1981. At the conclusions of Campbell's case the Court directed a verdict against him on his infringement allegations as to the last three claims (6, 7, 8) of the Gay patent. At the conclusion of final argument the Court indicated that it would hold that Campbell had not sustained his burden of proof on his infringement allegations as to the first five claims of the Gay patent.

After thorough consideration of the testimony and other evidence adduced at trial, as well as the argument and memoranda of counsel, the Court enters the following findings of fact and conclusions of law.

### **FINDINGS OF FACT**

The Gay patent describes a "method and apparatus for reducing sulphur and ash content of a solid material containing coal . . . " (px 1, p. 1). In general, it sets out a means of separating commercially saleable coal from surface mining refuse piles (called "gob" piles) that contain coal and other earthen

material. The first step in the process is to crush and screen the gob into particles no larger than  $1\frac{1}{4}$  inches in diameter. The particles are then combined with a high pressure (65 p.s.i.) stream of water in a round tank called a mixing chamber. The mixing of solids and water actually takes place in a hollow cylinder, called a mixing zone, which is described as swinging freely by chains within the mixing chamber. The solids-water mixture is pushed along the bottom of the mixing chamber by a second, low pressure (2 to 5 p.s.i.), stream of water toward an outlet pipe. This second stream of water prevents the buildup of material on the bottom of the mixing chamber. From the mixing chamber outlet pipe the solids-water mixture is pumped into a cyclone separator which has an adjustable vortex finder extending vertically upward out of the cyclone separator and also has, adjacent to its bottom, an outlet made up of three cones of successively decreasing angles— $68^\circ$ ,  $53^\circ$ ,  $7^\circ$ . The operation of the cyclone separator is such that usable coal along with some water exits through the vortex finder at the top while refuse material and remaining water is then separated from the coal and refuse and recycled (px 1).

The file wrapper of the Gay patent prosecution (px 3) indicates that the application was filed on March 3, 1973 in the name of Larry T. Gay. Of the seven claims tendered in the initial application claims 1 through 6 were rejected (*id.* at 35). The examiner indicated that claims 1, 3, 4 and 6 were rejected because they were obvious in light of prior art under 35 U.S.C. § 103. For these claims patents identified as Visman I (RE 26, 720) (px 3L), which described a cyclone separator, and Eichhorn (2, 918, 263) (px 3H), which describes a means of mixing solid particles with a high pressure water stream in a hollow cylinder, were specifically cited as prior art references (px 2 at 35). The examiner indicated that claims 2 and 5 were also rejected because they were obvious in light of prior art under 35 U.S.C. §



103. For these claims the Visman I and Eichhorn patents along with a patent described as Visman II (3, 487, 923) (px 3M), which describes an apparatus for separating mixtures of solid particles and liquid by means of pumping the solids-liquid mixture from a tank into a cyclone separator, were specifically cited as prior art references (px 2 at 35). The examiner further indicated that claims 1 through 6 were also invalid because the application did not adequately specify the manner and process of making and using the invention as required by 35 U.S.C. § 112. The examiner also cited the following patents as pertinent prior art:

Gaddis	RE 27,681	(px 3P)
Pardee	1,149,463	(px 3A)
Krijnsman	2,701,641	(px 3D)
Fontein II	2,819,795	(px 3F)
French patent	815,247	

as required by 35 U.S.C. § 112.

Pursuant to a successful petition to revive (px 2 at 55), the application was amended and resubmitted. Claim 6 was deleted, claims 1, 4, 5 and 7 were amended, and two new claims, 8 and 9, were added (*id.* at 37-43). The remarks accompanying the amendments contested the examiner's determination that independent claims 1 and 4 were obvious in view of the Eichhorn and Visman I patents. Specific elements of the Gay system that were emphasized as distinct from the teachings of Eichhorn and Visman I included: (1) a mixing zone centrally located within a mixing chamber (*id.* at 45, 47), (2) the step of introducing a high pressure stream of water downwardly and centrally into the mixing zone (*id.*), (3) a second stream of water into the mixing chamber adjacent to the bottom of the mixing chamber (*id.*), and (4) a second hydrocyclone cone angle of 53° (*id.* at 46, 48). These elements were not added by the amendments, but rather

were described in the claims presented in the initial application.

The examiner apparently acceded to the representations made in the remarks accompanying the amendments because in passing on the amended application he rejected claims 1 through 5 but noted that they would be allowed with minor amendment (*id.* at 64-65). The suggested amendments were duly made and the patent was granted on December 16, 1975 (*id.* at 66-75). In the patent as issued claim 7 in the application, which was allowed initially, was renumbered as claim 6, Claims 8 and 9 in the amended application were renumbered, respectively, as claims 7 and 8. Claims 1, 4, 6, 7 and 8 are independent claims; claims 2, 3, and 5 are dependent claims. All eight claims of the Gay patent are set out in the appendix of this opinion.

The equipment accused of infringing on the Gay patent is the coal washing apparatus manufactured by CPE called the "CPE Hydromatic Modular, Multimedia Coal Washer" (doc. 48, p. 2; px 4). The purpose of the CPE coal washer is essentially the same as that of the Gay system, it separates saleable coal from solid particles containing coal and other earthen material. The first step in the CPE process is to crush the solid material into particles no larger than 3/4 of an inch in diameter. The particles are then combined with water and dumped into a water-filled rectangular slurry tank. The solids-water combination that goes into the CPE slurry tank is not under pressure, though it does go in at some velocity and the particles undoubtedly bounce off each other as they fall toward an outlet pipe at the bottom of the tank. There is no device within the CPE slurry tank for the purpose of inducing or maintaining a churning action. Rather, the CPE tank is designed to minimize the agitation of the particles. Also, particles build up on the bottom and along the sides of the CPE tank; this buildup serves the purpose of preventing damage to the tank by the abrasive effect of particles colliding with the tank sides. There is no stream of water

at the bottom of the tank pushing the particles toward the outlet pipe. From the outlet pipe the particles, along with some water, are pumped into a set of identical cyclone separators each of which has an adjustable vortex finder extending vertically upward out of the cyclone separator and an outlet adjacent to its bottom made up of three cones of successively decreasing angles— $67\frac{1}{2}^{\circ}$ ,  $37\frac{1}{2}^{\circ}$ ,  $5-10^{\circ}$ . The operation of a CPE cyclone separator is the same as that of the Gay cyclone separator, usable coal along with some water exits through the vortex finder while refuse material and the remaining water exits through the bottom. The refuse is then put into a secondary slurry tank from which it is pumped through another set of cyclone separators for the purpose of separating out more coal. The water is eventually separated from the coal and refuse and recycled (px 4, 35a, 35b).

CPE is an Ohio corporation incorporated in 1973. Its majority stockholder and chief operating officer is Walter T. McCartney. In 1969 McCartney and two friends, James Loughner and Russ Campbell, discussed the possibility of recovering saleable coal from gob piles by using a coal washing process that incorporated a cyclone separator. For a number of years prior to 1969 each of these men had been active in coal mining and coal processing endeavors. During 1968 and early 1969 Loughner had fabricated a cyclone separator which he thought could be utilized in a coal washing plant. The three men incorporated Pennsylvucky Holding Company in July of 1969 and through it obtained a lease on a gob pile near Buffington, Pennsylvania.

In an effort to gain financing for a coal washing plant Russ Campbell contacted defendant Bobby C. Campbell, a physician in Pisgah, Ohio (who is unrelated to Russ Campbell). Dr. Campbell was known to Russ Campbell as someone interested

in investing in new business ventures. In March, 1970 McCartney, Loughner, Russ Campbell, and Dr. Campbell met and decided to set up an experimental coal washing plant at the Buffington site<sup>1</sup> using Loughner's cyclone separator. It was also decided that Dr. Campbell would contribute \$5,000 to the capital of the corporation and would supply it with the use of a leased pick-up truck. In return for his contribution to capital Dr. Campbell was to receive 65 shares of Pennsylvucky Holding Company stock. McCartney and Loughner were each to receive 65 shares of Pennsylvucky stock also; Russ Campbell was to receive 25 shares. There was discussion among the four shareholders about financing a major plant if the experimental effort proved successful, however no decision was reached.

The Buffington experimental plant was completed in May, 1970 and put into operation for a period of about two weeks. McCartney and Loughner apparently supervised the setup and operation of the plant; Dr. Campbell never saw the plant in operation. While the Buffington plant never ran continuously for more than an hour, it produced saleable coal.

Loughner, McCartney and Russ Campbell met again with Dr. Campbell and told him that the experiment had been a success and that Pennsylvucky Coal Company should pursue development of a commercial coal washing facility. They told Dr. Campbell that \$100,000 would be necessary to finance such a plant and that it was their understanding that Dr. Campbell would raise the necessary capital. Dr. Campbell told them that he thought the best course to take was to obtain more gob pile leases before building a major plant, and that if he was to come up with the funds needed for a major plant he would have to gain control of the corporation by holding 51 percent of the

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<sup>1</sup> During trial this site was variously referred to as the Buffington site, the Pennsylvucky plant, and the New Salem Dump.

outstanding stock.

McCartney, Loughner and Russ Campbell would not agree to Dr. Campbell's terms, and the Pennsylvucky venture never continued. In a letter to McCartney dated June 26, 1970 (px 36) Dr. Campbell complained that his stock certificates for Pennsylvucky Holding Company had never been issued to him and that the truck he had leased for the company was returned in damaged condition, which he demanded the company pay for. The last paragraph of the letter stated:

I shall expect some response from [sic] you within the next few days regarding these items. Contrary to what you may or may not have heard most things including pigs usually pay off for me one way or the other.

Dr. Campbell testified at trial that the reference to "pigs" was meant to recall to McCartney a humorous anecdote Dr. Campbell had told him regarding a pig farm venture Dr. Campbell had invested in, and that the reference was not intended as a personal innuendo. McCartney testified that while he did not recall the anecdote, he did not take offense at the "pigs" reference. McCartney apparently never responded to Dr. Campbell's letter.

After the Pennsylvucky endeavor the shareholders went in different directions. Loughner went into designing and manufacturing coal washing plants on his own and continues to do so. The first plant manufactured by Loughner was sold to Recco Coals, Inc., of Bartley, West Virginia—which was a subsidiary of Whitco Company. This plant, which was referred to throughout the trial as the "Whitco plant," was designed and fabricated in Huntington, West Virginia, during 1971 and installed at the Bartley site in the spring of 1972. The plant had a circuit similar to that used in the Pennsylvucky plant and produced saleable coal from gob piles (dx 20).

In addition to his manufacturing activities Loughner joined with Russ Campbell to form Wasego Corporation. Wasego's principal endeavor was to obtain leases on gob piles that could be processed by Loughner's plants. Russ Campbell did most of the traveling and negotiation needed to obtain the leases.

About a year after the Pennsylvucky operation closed down McCartney teamed up with Russ Campbell to form McCartney & Associates, they worked up a model of a coal washing plant and distributed brochures in an effort to solicit orders for plants they could manufacture. This effort met with no success. In 1973 McCartney teamed up with another person, Harry Fabe, to form CPE. The company went into the manufacture and sale of coal washing equipment. Fabe served as president and chief executive officer; McCartney, as noted above, was chief operating officer. Russ Campbell was hired by CPE in 1974 as manager of field assembly and service. Fabe left the company in 1980; McCartney purchased his stock for \$500,000. John Richards was hired to serve as president and chief executive officer of CPE.

In May or June of 1970 Dr. Campbell organized Pisgah Investment Company for the purpose of leasing gob piles and developing coal washing plants. He sold Pisgah stock to about ten investors in order to raise the necessary capital. About \$120,000 was obtained. Among the investors were Carl Rose and Thomas Stonerook. Rose had been employed by Pennsylvucky Holding Company and worked at the experimental plant at the Buffington site. Stonerook was an engineer Dr. Campbell met through an airplane club.

Pisgah obtained a lease on a gob pile, called the Shaft dump, near Frostburg, Maryland<sup>2</sup> and set up a coal washing

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<sup>2</sup> During trial this site was referred to as the Frostburg site and the Shaft plant.

plant at the site. Stonerook and Rose supervised the construction and operation of the plant. Some of the equipment from the Pennsylvlucky plant, including the cyclone separator, was used at the Shaft plant.

During late 1970 and early 1971 Stonerook and Rose initiated a patent application on a cyclone separator (px 45). This application was assigned to Pisgah and then abandoned when Stonerook left the employ of Pisgah in June, 1971.

In addition to the Shaft site Pisgah endeavored to establish a coal washing plant at a site called the Ocean mine which was also near Frostberg, Maryland. From the outset Pisgah's operations met with considerable difficulty. The coal washing plant at the Shaft site clogged quite a bit. In early 1971 Dr. Campbell started consulting with Larry T. Gay regarding the difficulties at the Shaft plant. Gay was a machinist and vocational education teacher who was related to Dr. Campbell by marriage. Gay visited the Shaft plant a number of times in the winter and spring of 1971. In July of 1971 Gay went to work for Pisgah full time and was charged with running the Shaft plant and establishing a plant at the Ocean site. At the time Gay came to the Shaft plant it was not operating. Gay made a number of repairs and changes in the equipment. He first changed the slurry tank or mixing chamber of the plant so that crushed gob would be mixed with a high-pressure stream of water in a cylindrical sleeve that hung within the mixing chamber. Gay found that by keeping the solids-water mixture churned up before entering the outlet pipe the clogging problems were avoided. For this reason he also injected a low-pressure water stream adjacent to the bottom of the mixing chamber to push the churning solids-water mixture toward the outlet pipe.

Gay next worked on the cyclone separator in an effort to lower the amount of coal in the refuse that came out the bottom

of the cyclone along with the water. He found initially that about 22 percent of the refuse was coal. Upon opening the cyclone separator he found that the three metal cones at the bottom were almost completely worn away. Gay had three different combinations of cones fabricated, experimenting with various angles to see which made the cyclone separator perform most efficiently.

It was not until March, 1972 that the Shaft plant began to produce saleable coal. Pisgah was interested in obtaining additional capital investment in order to enhance its operations. In the spring of 1972 Russ Campbell contacted Dr. Campbell about a possible takeover of Pisgah by Wasego Corporation. Dr. Campbell expressed interest. Russ Campbell then visited the Shaft plant and observed its operation for several hours. Russ Campbell reported back to Dr. Campbell, but no merger was pursued.

Gay continued to refine the operations of the Shaft plant. He was encouraged by an acquaintance to explore patentability. Through Robert Reed, who was an airplane club acquaintance of Dr. Campbell, Gay was put in contact with William S. Dorman, a patent attorney in Tulsa, Oklahoma. Dorman visited the Shaft plant in the fall of 1972 and obtained drawings of the plant from Gay. Those drawings and Gay's description of the operation the Shaft plant in essence made up Gay's patent application. One facet of the Shaft plant was left out of the Gay application, however. Gay's application, and the patent as issued, describe the cylindrical hollow sleeve in the mixing chamber as hanging by chains so it can be swung freely and thereby prevent clogging in the chamber (see px 1, col. 4, ln 2-4). By the time the application was submitted to the Patent Office Gay had put three bars or struts between the wall of the mixing chamber and the hollow sleeve in order to minimize the swing-



ing action of the sleeve. This mode was superior in operation when compared to the free-swinging mode. Gay did not inform his patent attorney of this change.

At the time of the application Gay was aware, through Rose, that a coal washing plant had been operated by Pennsylvucky near Buffington, Pennsylvania. He was also aware, apparently through Rose and Russ Campbell, that Loughner had designed and built a coal washing plant. Through a Patent Office search by his patent attorney Gay learned of the Visman I patent for a cyclone separator (px 3L, 38). He reviewed Visman I and told his patent attorney that the cone angles in his cyclone separator were different from those in Visman I. Also some time before applying for the patent Gay saw a brochure or advertisement depicting and describing a coal washing plant manufactured by McNally-Pittsburg, Inc., which utilized the Visman I cyclone separator (px 17, 17-A). Gay discussed this information with his attorney, noting the resemblance between the McNally-Pittsburg design and the Shaft plant, and also noting the similarities between the Visman I cyclone separator and his own.

Gay's patent application, which was filed March 3, 1973, cited the Visman I patent as a prior art reference. It did not, however, disclose the existence of the Pennsylvucky plant, the Shaft plant, and the Loughner plant, nor did it disclose the McNally-Pittsburg information. The abandoned cyclone separator patent application made by Stonerook and Rose was also not disclosed, but Gay apparently was not aware of it until after filing his own application.

During 1972 it became evident to Pisgah investors that the Shaft and Ocean operations could not be run profitably. In late 1972 Dr. Campbell, Gay and Reed organized CG Coal Processing Corporation for the primary purpose of preparing and pro

secuting the Gay patent application. In February, 1973 Gay assigned all the rights he had in the application then being prepared to CG Coal (doc. 24). Also in late 1972 Dr. Campbell and Reed along with a few other investors organized Cinco Corporation for the purpose of setting up a coal processing operation. Cinco obtained a lease on a gob pile near Uniontown, Pennsylvania and set up a plant with equipment purchased from Pisgah. The Pisgah operations near Frostberg, Maryland, stopped in early 1973; its assets were sold to Cinco and others. Dr. Campbell and the other Pisgah shareholders received a total return of about \$75,000 on their investment of nearly \$120,000. Cinco's Uniontown operation was supervised by Gay. It operated only a few weeks before closing down because of disagreements among the men operating it. The investors apparently lost their money.

After the Cinco and Pisgah operation stopped Gay had no further involvement in the coal plant operations. Since 1973 he has built two processing plants based on his design, but has sold only one. He sold his CG Coal stock to Reed in the summer of 1973.

From 1973 until 1977 Dr. Campbell had no involvement in coal processing activities. In March 1977 he sold his CG Coal stock to Reed and purchased the Gay patent from CG Coal for \$10,000. Also in 1977 Dr. Campbell and F. W. Schneider entered into a partnership, C & S Coal Reclamation, for the purpose of setting up a coal washing plant at the gob pile formerly leased by Pennsylvtucky near Buffington, Pennsylvania. The plant developed by C & S did not use a cyclone separator.

It was in August or September, 1977 that Dr. Campbell secured the lease on the Buffington gob pile for C & S Coal. The lease was obtained from a Mr. Rozak who owned the land

underlying the gob pile. During their discussions Dr. Campbell showed Mr. Rozak a copy of the Gay patent. Mr. Rozak remarked that he thought CPE was building plants like those used by Pisgah. Dr. Campbell testified at trial that Mr. Rozak had "been in the coal business for some time." A bit later Dr. Campbell spoke by telephone with a Mr. Lynch and a Mr. Alpie whom Dr. Campbell apparently knew from his involvement with Pisgah. Lynch and Alpie read to Dr. Campbell an article from a coal industry publication regarding the coal washing plants being manufactured by CPE and Loughner. The article listed some of the customers of CPE and Loughner. Later in 1977 Mr. Lynch showed the articles to Dr. Campbell.

During October or November, 1977 Dr. Campbell saw, from a distance, two CPE plants. One was at the Collier dump near Uniontown, Pennsylvania, the other was at the Connells-ville, Pennsylvania, airport. Neither plant was in operation at the time. Dr. Campbell did note that the slurry tanks for the CPE plants were rectangular.

Sometime in late 1977 Dr. Campbell discussed the information he had about CPE with Reed, raising the possibility that CPE might be infringing the Gay patent. Reed put Dr. Campbell in touch with Lawrence Johnson, a Tulsa, Oklahoma attorney. Johnson and Dr. Campbell talked about the matter over the telephone. In November of 1977 Johnson and Reed flew to Ohio to meet with Dr. Campbell to discuss the possibility of bringing an infringement action against CPE.

Reed had represented to Dr. Campbell that he had a degree in electrical engineering and was a petroleum engineer. Johnson represented to Dr. Campbell that while he was not certified to practice before the United States Patent Office he had ample experience trying patent cases.

After their meeting Dr. Campbell and Reed drove to a CPE

plant that was operating near Connellsville, Pennsylvania. While Dr. Campbell waited in the car, Reed examined the plant. Reed reported to Dr. Campbell that the CPE plant was almost exactly like the Gay plant. After the visit to the CPE plant Reed returned to Tulsa. Dr. Campbell then called Johnson and instructed him to send letters to CPE customers accusing them of infringing the Gay patent. Letters were also sent to customers of Loughner.

In letters dated January 20, 1978 Johnson accused 14 coal-related businesses of patent infringement (px 28a-u). CPE was one of the 14 (px 28k). Each letter reads as follows:

Gentlemen:

I represent Bobby C. Campbell who is the owner of U.S. Patent No. 3926787, "Method and Apparatus for Reducing Sulphur and Ash Content of Coal".

It has come to our attention that you are guilty of infringement of this patent in your business operations.

We call upon you to immediately cease and desist in this infringement and contact the undersigned immediately regarding an accounting as to your income for use of this patent.

In the event you wish to discuss settlement of this controversy, please contact the undersigned. If you reject our claim, please advise in order that we may commence suit.

Very truly yours,

LAWRENCE A. JOHNSON

At trial Dr. Campbell testified that at the time the letters were sent he did not know whether CPE's equipment had a hollow sleever similar to that in the Gay mixing chamber, he did not know what the cone angles of the CPE cyclone separator were, he did not know the pressure of the water introduced into the CPE slurry tank, and he did not know if there was a low

pressure stream of water introduced into the bottom of the CPE slurry tank. Dr. Campbell further testified that he had reviewed the essentials of the Gay patent claims with Reed and Johnson before the letters were sent and that he had relied on their advice in sending the letters. He also testified that he had compared a CPE brochure with the Gay patent.

Neither Reed nor Johnson testified at trial. Johnson was present throughout the trial, serving as co-counsel to Dr. Campbell's trial attorney, William Dorman. It was represented to the Court by Mr. Dorman that Dr. Campbell would not call Johnson as a witness because if he did CPE's trial attorney had indicated CPE would call Mr. Dorman and that if CPE did so Dr. Campbell would be without representation. The advice of the Court was not requested on this point. The Court noted that it could not tell parties which witnesses to call. Messrs. Rozak, Alpie and Lynch also did not testify.

In response to the infringement letters CPE wrote two letters to Johnson, one dated January 27, 1978 and the other dated February 7, 1978 (px 12A & B). Both letters denied infringement and asked for a specific reference as to which claims of the Gay patent CPE's equipment infringed. Johnson did not respond to these letters.

As noted above, CPE filed its complaint and petition in this action asking for declaratory and injunctive relief as well as damages on March 24, 1978. There apparently was no communication between the parties until just prior to the filing of the complaint. Through the course of this litigation, until trial, Dr. Campbell made no offer to settle this action nor did he offer to withdraw his infringement claims.

Also as noted above, this Court issued a pretrial order on January 17, 1980 directing that Dr. Campbell, his counsel, and his expert witness be given an opportunity to observe a CPE

plant in operation. Such an opportunity was afforded, but the operator of the plant, which was located at Madisonville, Kentucky, did not permit the Campbell group to take motion pictures of the plant and CPE did not make any such request of the operator on behalf of the Campbell group. Prior to trial Dr. Campbell's counsel made no request to the Court for its assistance in this matter. At trial Dr. Campbell's counsel requested that the Court view the Madisonville plant in order to resolve a dispute between the experts of the parties as to whether there was turbulence in the CPE slurry tank. This request was denied, the Court ruling that such a view would be for the purpose of gathering evidence and was not an appropriate judicial function. In a post-trial motion Dr. Campbell's counsel asked that the record of the action be reopened for the purpose of allowing motion pictures of the operation of the slurry tank at the Madisonville plant to be taken and entered into the trial record (doc. 70). The motion was denied (docs. 77, 78).

CPE has suffered damages as a result of the infringement accusations of Dr. Campbell. A number of potential customers have refused to purchase CPE plants until the infringement accusations were resolved. Lines of credit with suppliers and banks were extinguished. Most of the CPE's employees have been laid off. CPE petitioned for reorganization of its debts under Chapter 11 of the Bankruptcy Act in May, 1980.

News of the infringement allegations spread quickly within the coal washing industry. CPE's sales fell off precipitously after the Johnson letters were sent. CPE took the accusations seriously and instituted this action as a means of resolving the accusations in a sure manner. Except for the infringement letters, no evidence was offered by Dr. Campbell to show he was prepared to resolve his infringement accusations by litigation.

## CONCLUSIONS OF LAW

Four different causes of action were tried to the Court. We will first decide Dr. Campbell's allegation that CPE's plant infringes the Gay patent. Then we will rule on CPE's claim that the Gay patent is invalid. New CPE's assertion that defendant committed tortious unfair competition will be determined. Finally, CPE's request for attorney fees will be considered.

### A. Infringement

As pointed out in the findings of fact, the Gay patent has eight claims, five of which are independent claims—claims 1, 4, 6, 7 and 8. Claims 2, 3 and 5 are dependent claims, and they cannot be infringed if the independent claims upon which they depend are not infringed. *Autogiro Company of America v. United States*, 384 F. 2d 391, 408 (Ct. Cl. 1967); *Landy Elec. & Sys., Inc. v. Optical Recognition Sys., Inc.*, 362 F. Supp. 130, 164 (E.D. Va. 1973), *affirmed*, 493 F. 2d 1222 (4th Cir. 1974); see 35 U.S.C. § 112. As noted above, a directed verdict was entered against defendant on his infringement allegations regarding independent claims 6, 7 and 8. Hence our initial focus should be on the infringement allegations regarding independent claims 1 and 4. If they are not infringed, then no claim of the Gay patent is infringed.

Claim 1 defines a method of separating a saleable coal product from a solid material that contains coal. The pertinent elements of claim 1, with bracketed drawing reference numbers, are the steps of

(1) introducing a pre-crushed and pre-screened quantity of said solid material [10] of particle size  $1\frac{1}{4}$  x 0 inch into a mixing zone [54] located centrally within a mixing chamber [12], said mixing zone being open at the top [62] and the bottom [60] and communicating at said bottom with said mixing chamber [12].

(2) introducing a first stream of water [14] downwardly and centrally into said mixing zone at about 65 p.s.i. to create a condition of turbulence within said zone and within said mixing chamber,

(3) introducing a second stream water [16] into said mixing chamber at about 2 to 5 p.s.i. under substantially quiescent conditions and adjacent the bottom [58] of said mixing chamber[12], [ . . . and]

(4) passing the tangentially moving solids-water mixture further downwardly into contact with a second conical member [113] extending from said first conical member to the bottom of said cyclone separator and having a cone angle of generation approximately equal to  $53^{\circ}$  [.]

Claim 4 is an apparatus claim which describes the combination of mixing device with a separating device for the purpose of separating a saleable coal product from solid material containing coal. The pertinent elements of claim 4, with drawing reference numbers noted in brackets, are:

(1) means establishing a mixing zone [54] located centrally within said mixing chamber, said mixing zone [54] being open at the top [62] and the bottom [60] and communicating at said bottom with said mixing chamber [12], [ . . . ]

(2) means [14, 78] for introducing a first stream of water downwardly and centrally into said mixing zone [54] to create a condition of turbulence within said zone and within said mixing chamber [12],

(3) means [16, 17] for introducing a second stream of water into said mixing chamber [12] under substantially quiescent conditions and adjacent the bottom [58] of said mixing chamber [12], [ . . . and]

(4) a second conical member [113] extending from said first conical member [111] to said bottom [84] of said cyclone separator [24] and having a cone angle of generation approximately equal to  $53^{\circ}$  [.]



It is well established in patent law that infringement is determined by reference to the claims of a patent, and that every element of a claim charged to be infringed must be found in the infringing device. *McClain v. Ortmyer*, 141 U.S. 419, 425 (1891); *Scharmer v. Carrollton Mfg. Co.*, 525 F. 2d 95, 103 (6th Cir. 1975); P. Rosenberg, *Patent Law Fundamentals*, § 17.07 (1980).

None of the elements of claims 1 and 4 of the Gay patent set out above are in the accused CPE system.

The slurry tank in CPE system is analogous to the "mixing chamber" described in the Gay patent, however there is nothing in the CPE system analogous to the "mixing zone" described in the Gay patent. The "mixing zone" is a cylindrical sleeve within the mixing chamber. Under the Gay patent the initial combining of the coal material and water takes place in the "mixing zone." The CPE system contemplates that the material is combined with water before it enters the slurry tank.

The high pressure water stream which the Gay patent describes as being introduced into the "mixing zone" for the purpose of creating turbulence is in no way duplicated by the CPE equipment. The coal and water combination that comes into the CPE slurry tank does not come in under pressure, and there is no device in the CPE slurry tank that is meant to create turbulence. Indeed the CPE slurry tank was designed to minimize agitation in the slurry tank. Also, the CPE slurry tank has nothing similar to the low pressure stream of water introduced adjacent to the bottom of the mixing chamber described in the Gay patent.

Finally, the middle cone angle in CPE's cyclone separator, which is  $37\frac{1}{2}$  degrees, is substantially different from that described in the Gay patent, 53 degrees. This difference is especially notable because the second cone angle in the CPE

cyclone separator is same as that in the prior-patented Visman cyclone separator (*see* px 33), and the prosecution history of the Gay patent shows that the second cone angle was an element relied upon to distinguish the Gay cyclone separator from prior art (px 2, pp. 45). Such a distinction cannot be disregarded when determining whether there is literal infringement. *Arco Industries Corp. v. Chemcast*, 633 F. 2d 435, 439 n. 6 and accompanying text (6th Cir. 1980); P. Rosenberg, *supra*, § 17.07[3].

In sum, the accused CPE equipment does not directly infringe all of the elements of independent claims 1 and 4 of the Gay patent. Hence those claims are not infringed. And, because the independent claims they derive from are not infringed, dependent claims 2, 3 and 5 are not directly infringed.

As an alternative to his allegations of direct infringement Dr. Campbell forwards the doctrine of equivalents as a basis for finding the CPE system infringes the Gay patent claims.

The doctrine of equivalents is a judicially developed doctrine that operates to expand the claims of a patent beyond what the meaning of their words can bear. T. Koykka, "Infringement of Patents," 42 F.R.D. 43, 55-56 (1967). "The doctrine does not excuse the omission of an essential element of a claim; it merely holds that the substitution of an 'equivalent' for an essential element does not avoid infringement." *Id.* at 56. *See* P. Rosenberg, *supra*, § 1707[1].

As described by the Supreme Court, the doctrine of equivalents dictates a finding of infringement when

an unauthorized device employs substantially the same means, to achieve substantially the same results, in substantially the same way, as that claimed . . . —even though not a single claim of the patent can literally be read on the unauthorized device.

*Sanitary Refrigerator Co. v. Winters*, 380 U.S. 30, 42 (1929).  
*Accord, Graver Mfg. v. Linde*, 339 U.S. 605, 608 (1950); *Arco Industries Corp. v. Chemcast*, 633 F. 2d at 438.

The general rubric of the doctrine of equivalents—"performs substantially the same function in substantially the same way to obtain the same result"—is not a particularly workable test. T. Koykka, *supra*, at 63-64. In *Graver Mfg. v. Linde, supra*, the Supreme Court recognized that

[e]quivalence, in patent law, is not a prisoner of a formula and is not an absolute to be considered in a vacuum. It does not require complete identity for every purpose and in every respect. In determining equivalents, things equal to the same thing may not be equal to each other, and by the same token, things for most purposes different may sometimes be equivalents . . .

339 U.S. at 609. The Court went on to note that a "finding of equivalence is a determination of fact," and set out four factors to be considered when passing on an equivalence issue:

- [1] the purpose for which an ingredient is used in a patent,
- [2] the qualities it has when combined with other ingredients, . . .
- [3] the function which it is intended to perform, [and . . .]
- [4] whether persons reasonably skilled in the art would have known of the interchangeability of an ingredient not contained in the patent with one that was.

Analyzing the pertinent facts of this action in light of these considerations, we cannot find that the CPE system is equivalent to the apparatus and process described in the Gay patent.

The most important ingredient of the system described in

the Gay patent, indeed the item which the defendant represented to be the "invention" of Gay, is the turbulent mixing of coal and water prior to separation by the cyclone separator. The apparatus within the Gay mixing chamber was designed to induce and maintain a churning action in order to keep the coal particles agitated and suspended as they entered the outlet pipe and were pumped into the cyclone separator. The high pressure water stream that comes into the mixing zone and is deflected by the conical baffle initiates the agitation process when the coal particles are dumped into the mixing zone. The second stream of water, which comes into the mixing chamber adjacent to its bottom and opposite the outlet pipe leading to the pump and cyclone separator, moves the churning particles toward the outlet pipe.

The CPE slurry tank, in comparison, does not have any apparatus in it to induce or maintain a churning action. Its design is aimed at minimizing agitation of the coal particles in order to allow buildup of material and thereby avoid abrasion of the tank wall.

The purposes of the Gay mixing chamber and the CPE slurry tank are similar in that they both combine water and coal prior to separation by cyclone separators. Their qualities and function within their respective systems are, however, quite different. The Gay mixing chamber is designed to maximize agitation of the coal and water combination. The CPE slurry tank is designed to minimize agitation. Since the functions of these analogous elements are quite dissimilar, it is doubtful that someone skilled in the art of coal washing would consider them interchangeable.

Dr. Campbell's primary argument on equivalence is that the dumping of a coal-water combination into a CPE slurry tank causes agitation equivalent to the agitation that takes place

in a Gay mixing chamber. There is undoubtedly agitation within the CPE slurry tank. As plaintiff's expert witness, Professor Sandy, testified, when coal particles of different sizes and weights are dumped into a slurry tank they bump into each other as they travel toward the outlet pipe. While it could be, though we doubt it, that the degree of agitation in a CPE slurry tank is about the same as that in a Gay mixing chamber, this result is not achieved in substantially the same way. Thus these ingredients, which are essential to the operation of their respective systems, are not equivalent.

Our conclusion regarding the application of the doctrine of equivalents in this case is strengthened by the policy within the law of giving broad protection from equivalents only to pioneer patents.

The broadest protection under the doctrine of equivalents is reserved for pioneer or generic patents, which cover a function never before performed, a wholly novel device, or one of such novelty and importance as to mark a distinct step in an art's progress as distinguished from a mere improvement or perfection of what had gone before.

P. Rosenberg, *supra*, § 17.07[1], p. 17-35. See *Catholic Protection Serv. v. American Smelting & Refining Co.*, 190 USPQ 254, 268-269 (S.D. Texas 1975).

Where a patent is a pioneer, the patentee is allowed to claim a wide range of equivalents. But where, as here, the patent represents only a small but significant advance because the art is crowded, the doctrine of equivalents is given a correspondingly narrow range.

*Bolkcom v. Carborundum Company*, 523 F. 2d 492, 503 (6th Cir. 1975). In light of the prior art considered by the patent examiner when passing on the Gay application (px 2, pp. 35-36) and the other prior art introduced by plaintiff (px 3A-S), the best that could be said for the Gay patent is that it is a small ad-

vance in a crowded art. Its claims should not be construed broadly when determining equivalence.

Even if the doctrine of equivalents did provide a basis for finding infringement in this case, its applicability would be superseded by the doctrine of file wrapper estoppel. This doctrine precludes a patent owner from recapturing in patent litigation the breadth which was given up in procuring the patent from the Patent & Trademark Office. *P. Rosenberg, supra*, § 17.07[2]. The doctrine of file wrapper estoppel cannot be overruled by the doctrine of equivalents. *Exhibit Supply Co. v. Ace Patents Corp.*, 315 U.S. 126, 136 (1942); *Arco Industries Corp. v. Chemcast*, 633 F. 2d at 438-439; *T. Koykka, supra*, at 67-68.

A basic statement of the doctrine of file wrapper estoppel is provided in *Graham v. John Deere Co.*, 383 U.S. 1, 33 (1966):

It is, of course, well settled that an invention is construed not only in the light of the claims, but also with reference to the file wrapper or prosecution history in the Patent Office. *Hogg v. Emerson*, 11 How. 587 (1850); *Crawford v. Heysinger*, 123 U.S. 589 (1887). Claims as allowed must be read and interpreted with reference to rejected ones and to the state of the prior art; and claims that have been narrowed in order to obtain the issuance of a patent by distinguishing the prior art cannot be sustained to cover that which was previously by limitation eliminated from the patent. *Powers-Kennedy Co. v. Concrete Co.*, 282 U.S. 175, 185-186 (1930); *Schriber Co. v. Cleveland Trust Co.*, 311 U.S. 211, 220-221 (1940).

A "file wrapper" consists of the official record of a case within the Patent & Trademark Office. It includes the application, amendments, and arguments submitted by an applicant. *P. Rosenberg, supra*, § 17.07[2] p. 17-41. It also includes admissions made by an applicant after rejection to clarify the meaning of a claim without rewriting the claim. *Duplan Corp. v.*

*Deering Milliken, Inc.*, 181 USPQ 621, 631-633 (D.S.C. 1974); *Welch v. General Motors Corp.*, 330 F. Supp. 80, 83-84 (E.D. Va. 1970), *affirmed per curiam*, 170 USPQ 1 (4th Cir. 1970).

As noted in the findings of fact, the applicant in this case specifically argued that the mixing zone, the high pressure water stream, the second water stream, and the second cone angle distinguished his apparatus from prior art. We conclude that these elements should be considered limitations for the purpose of determining if the accused equipment infringes. The CPE system has no elements comparable to those specifically argued in the Gay file wrapper. Hence the defendant is estopped from contending that those elements are infringed.

## **B. Validity**

CPE contends the Gay patent is invalid for any of three reasons: obviousness in view of prior art, failure to disclose the "best mode" of operation, and fraud on the Patent Office. We will deal with these arguments *seriatim*.

### **1. Obviousness**

The standard for obviousness is provided by 35 U.S.C. § 103:

A patent may not be obtained though the invention is not identically disclosed or described as set forth in Section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The usual factual determinations a trial court must make to reach a conclusion on obviousness are, first, the scope and content of prior art, second the differences between the prior art and the claims at issue, and third the level of ordinary skill in the

pertinent art. *Graham v. John Deere Co.*, 383 U.S. at 17; *Universal Electric Co. v. A. O. Smith Corp.*, 643 F. 2d 1240, 1246 (6th Cir. 1981).

The starting point in analyzing a challenge to a patent's validity is the statutory presumption of validity. 35 U.S.C. § 282. This presumption is based on the acknowledged experience and expertise of the Patent Office. The issuance of a patent constitutes a type of administrative determination supported by evidence. *American Seating Co. v. National Seating Co.*, 586 F. 2d 611, 615 (6th Cir. 1978); *Parker v. Motorola, Inc.*, 525 F. 2d 518, 521 (5th Cir. 1975), *cert. denied*, 425 U.S. 975 (1976). The Sixth Circuit has pointed out that this presumption merely places the burden of proof of invalidity and has no independent evidentiary value. *Universal Electric Co. v. A. O. Smith*, 643 F. 2d at 1245; *Sperberg v. Goodyear Tire & Rubber Co.*, 519 F. 2d 708, 713 (6th Cir. 1978), *cert. denied* 441 U.S. 907 (1979). While it is firmly established that the presumption is greatly weakened when the Patent Office has failed to consider pertinent prior art, *Universal Electric Co. v. A. O. Smith Corp.*, 643 F. 2d at 1245, it is just as firmly established in the Sixth Circuit that the presumption is greatly strengthened when the Patent Office has considered the pertinent prior art offered at trial to show obviousness. *Tapco Products Co. v. Van Mark Products Corp.*, 446 F. 2d 420, 426 (6th Cir. 1971), *cert. denied*, 404 U.S. 986 (1972); *Great Lakes Equipment v. Fluid Systems, Inc.*, 217 F. 2d 613, 617 (6th Cir. 1954).

The doctrine of strengthened presumption was announced in *Williams Mfg. Co. v. United Shoe Mach. Corporation*, 121 F. 2d 273 (6th Cir. 1941), *affirmed*, 316 U.S. 364 (1942). In that case the accused infringer of a shoe manufacturing machine patent challenged the validity of the patent by pointing out functions that were disclosed in prior patents. In upholding the trial



court's finding of validity and infringement the Sixth Circuit noted that the most pertinent prior patent relied on to show obviousness was one that had been disclosed to the Patent Office by the applicant for the patent in suit. In light of this fact the Court stated,

To the presumption of validity that attached to a granted patent, where the most pertinent prior art has been cited against it in the patent office, there must probably now be added the force of a growing recognition of finality that is generally being accorded to administrative determinations supported by evidence, on the ground that the administrative agency is expected to have developed an expertness in its specific field beyond what may be expected from the courts wherein adjudications range the whole field of human controversies.

121 F. 2d at 277. Thus the Court severely discounted the value of prior art that had been disclosed to the Patent Office as a basis for finding a patent invalid because of obviousness.

In application this doctrine has meant that prior patents that were disclosed to the Patent Office cannot serve as prior art sufficient to support a finding of obviousness. See, *Tapco Products Company v. Van Mark Products Corp.*, *supra*; *Gibson-Stewart Co. v. Wm. Bros. Boiler and Mfg. Co.*, 264 F. 2d 776 (6th Cir. 1959), *cert. denied*, 360 U.S. 929 (1959); *Cold Metal Process Co. v. Republic Steel Corp.*, 233 F. 2d 828 (6th Cir. 1956), *cert. denied*, 352 U.S. 891 (1956). This doctrine has been further extended to prior art which has not been reviewed by the Patent Office but is substantially similar to prior art which was before the Patent Office. *Tapco Products Co. v. Van Mark Products Corp.*, 446 F. 2d at 426; *Goodwin v. Borg-Warner Corporation*, 157 F. 2d 267, 272-73 (6th Cir. 1946), *cert. denied*, 329 U.S. 799 (1946).

The effect of this prior art doctrine in this action is over

whelming. In the expert testimony it presented as well as in its argument CPE primarily relied upon three prior patents to show obviousness: Visman I (px 3L), Eichhorn (px 3H), and Fontein II (px 3F). Each of these three was reviewed by the patent examiner when he ruled on the Gay patent application (px 2, p. 36). Visman I and Eichhorn were specifically relied upon by the examiner in his initial rejection of six of the seven claims in Gay's application (*id.*). The application was then amended to meet the examiner's objections. Thus the primary prior art references CPE offered to show obviousness were not only before the patent examiner when he reviewed the Gay patent application, they were specifically relied upon by the examiner when he made his rejection and acceptance determinations.

Under the prior art doctrine developed in *Williams Mfg. Co.* and its progeny, the fact that the most pertinent prior art was considered by the patent examiner when passing on the Gay patent serves to strengthen the presumption of its validity. The practical effect of the application of this doctrine in this case is that the three patents CPE relied on most heavily as prior art cannot serve as evidence of obviousness. Without these three patents this Court cannot conclude that CPE has met its burden of proving invalidity.

CPE did, of course, introduce other patents as evidence of prior art. In all, CPE introduced as prior art 16 patents. Of those, seven were reviewed by the patent examiner in passing on the Gay application. Hence there are nine patents cited by CPE that were not reviewed by the Patent Office. None of the nine, however, were discussed in trial testimony or argument. Given the lack of significance CPE accorded the nine unreviewed patents we cannot conclude that they amount to prior art sufficient to overcome the now-heightened presumption of validity.

Patents were not, of course, the only prior art introduced

by CPE. Four other items were specifically mentioned: the McNally-Pittsburgh brochure (px 17), a 1971 Coal Mining & Processing magazine article (px 3Q), a 1965 Coal Mining & Processing Magazine (px 3R) and the Whitco plant developed by James Loughner (px 43A-K, 52 A-U).

The brochures and the 1971 article cannot be afforded much weight because both discuss application of the cyclone separator and circuit set out in the Visman I patent, which of course was reviewed by the Patent Office. The 1965 article describes a European coal processing system that utilizes cyclone separators. The description is, however, quite general and the depiction of the system in the article does not appear to be analogous to the diagrams in the Gay patent. The 1965 article cannot be considered pertinent prior art. The Loughner plant is certainly pertinent prior art, however it alone or it combined with the other prior art references that were not reviewed by the patent examiner cannot overcome the strengthened presumption of validity carried by the Gay patent.

## **2. Best Mode**

The description of an invention in a patent application "must set forth the best mode contemplated by the inventor of carrying out his invention." The purpose of the "best mode" disclosure requirement is to restrain inventors from applying for patents while at the same time concealing from the public preferred embodiments of their inventions which they have in fact conceived. *In re Gay*, 309 F. 2d 769, 772 (CCPA 1962).

The patentee need not disclose the "optimum" mode of carrying out the invention, nor must he disclose a better method, if he does not know of it. *Plastic Container Corp. v. Continental Plastics of Oklahoma, Inc.*, 607 F. 2d 885, 897 (10th Cir. 1979), cert. denied, 44 U.S. 1018 (1980). The patentee need only disclose the best mode he conceived for practicing his invention

at the time he made application. *P. Rosenberg, supra*, § 13.04[5] [b].

The failure to disclose alleged by CPE in this action is Gay's failure to disclose the three pieces of metal pipe he used to minimize the swinging action of the hollow sleeve in the mixing chamber. The patent says the sleeve is to be hung by chains such that it can swing freely. Gay had installed the pipes in his mixing chamber prior to applying for the patent and he considered them important to the operation of the mixing chamber.

The most recent Sixth Circuit case on "best mode" invalidity is *Union Carbide Corp. v. Borg-Warner Corp.*, 550 F. 2d 355 (1977), and it provides excellent precedent for our decision in this action because it contains an analogous fact situation and sets out the standard for deciding a best mode invalidity question.

The patent in suit in *Union Carbide* was for a process for molding thermoplastic articles. The specifications of the patent included a description on a particular type of valve. They also illustrated the "extruder" used in the process as a blank box, meaning any type of extruder could be used. The trial court found that at the time the patent application was filed the inventor had designed and used a valve that performed better than the one described in the patent, and had found that a particular type of extruder worked best in the process. The trial court determined that the inventor had not disclosed the "best mode" in his application and therefore the ensuing patent was invalid. The Sixth Circuit affirmed, holding that, even with the presumption of patent validity provided by 35 U.S.C. § 282, the trial court's findings were supported by substantial evidence and not clearly erroneous.

In reaching its decision, the Sixth Circuit noted that the inventor's failure to disclose the best mode in the application did

not have to rise to "the level of active concealment or grossly inequitable conduct in order to warrant invalidation of a patent." 550 F. 2d at 363. The inventor need only have known of the better mode and not disclosed it in order to suffer a finding of invalidity. The omission need not have been deliberately concealed. *Id.* at n. 7.

As pointed out in the findings of fact in this opinion, Gay failed to disclose the use of the stabilizing pipes in the mixing chamber. Under the precedent of *Union Carbide* this failure, whether deliberate or inadvertent, is sufficient to invalidate the patent, and the Gay patent will be held invalid for that reason.

### 3. Fraud on the Patent Office

The final ground plaintiff forwards for its contention of patent invalidity is that the Gay patent application fraudulently omitted to disclose pertinent prior art to the Patent Office. Plaintiff alleges that the application failed to disclose the prior Pennsylvtucky Plant, the prior Shaft Plant, the hydrocyclone designed by Loughner in 1971 (px 37) and the hydrocyclone embodied in the Stonerook & Rose patent application made and abandoned in 1971 (px 45).

The defense of fraud on the Patent Office arises out of each applicant's duty of frank and truthful disclosure to the Patent Office of everything that had gone on before with respect to what he is trying to patent. *Layne-New York Co., Inc. v. Allied Asphalt Co., Inc.*, 363 F. Supp. 299, 307 (W. D. Pa. 1973). The granting of patents must, of course, be free from fraud or other inequitable conduct. *Precision Co. v. Automotive Co.*, 324 U.S. 806 (1945).

The defense is generally made in two formulations. First, in terms equivalent to common law fraud: (a) representation of (b) a material fact that is (c) false with (d) intent to deceive, and (e)

reasonable reliance, and (f) deception by reason of the reliance, and (g) injury. P. Rosenberg, *supra*, § 15.08 at 15-74. The second formulation is in terms of the equity doctrine of unclean hands; it is used when not all elements of fraud are available. *Winter v. Korathan*, 375 F. Supp. 1, 66 (N. D. Cal. 1974). P. Rosenberg, *supra* at 15-74. The basic difference in the two formulations is that a patent procured by fraud is invalid, whereas a patent tainted by inequitable conduct is just unenforceable. *American Optical Corporation v. United States*, 179 USPQ 682 (Ct. Cl. 1973); P. Rosenberg, *supra*, at 15-74.

It should be noted that a concealment or nondisclosure is equivalent to a false representation for purposes of a defense of fraud on the Patent Office. *Layne-New York Co., Inc.*, 363 F. Supp. 299 (W. D. Pa. 1973). In any case it must be shown that "but for" the omission or misrepresentation the patent claims would not have been allowed. *American Optical*, 179 USPQ at 684.

Under Sixth Circuit precedents a party proceeding with a defense based on either actual fraud or inequitable conduct must show fraudulent intent by "clear, unequivocal and convincing" evidence. *Kearney & Trecker Corp. v. Cincinnati Milacron Inc.*, 562 F. 2d 356, 371 (6th Cir. 1977); *Schnadig Corporation v. Gaines Mfg. Co.*, 494 F. 2d 383, 392 (6th Cir. 1972). "[M]ere technical fraud is not sufficient to deny enforceability." *Kearney & Trecker, supra* at 271; *see, Kolene Corp. v. Motor City Metal Treating, Inc.*, 440 F. 2d 77, 83 (6th Cir. 1971).

As CPE's counsel admitted in his closing argument, the failure to mention the alleged items of prior use and design in the Gay patent application only amounted to technical fraud. There was no strong evidence of fraudulent intent on the part of Gay or his attorney, certainly not enough to be "clear, convincing, and unequivocal." The Pennsylvlucky Plant was, by virtual-

ly all descriptions, an experimental effort, essentially a feasibility test of a theory. For purposes of a fraud defense, there is no duty to disclose a prior use or sales to which there is a *bona fide* basis for believing the use was experimental. *Clark Equipment Co. v. Keller*, 197 USPQ 83, 122 (D. N.D. 1976). This rationale can be applied to the Shaft Plant as well because it was at that plant that Gay developed his apparatus. For Gay's purposes the Shaft Plant was experimental.

As for the nondisclosure of the cyclone separator designs of Loughner and Stonerook and Rose, it is apparent that neither Gay nor his attorney were aware of them. Gay did not know of the Stonerook and Rose applications until after he filed his own. Gay knew that Loughner had designed and built a plant, but there was no evidence that Gay knew of the specific designs developed by Loughner or that the plant had been sold or was operating. This lack of knowledge would make it impossible for Gay to formulate the requisite fraudulent intent to omit. Hence the Gay patent cannot be found invalid for failure to disclose pertinent prior art to the Patent Office.

### **C. Unfair Competition**

In its second cause of action CPE alleges that Dr. Campbell intentionally and improperly interfered with CPE's sales to present and future customers by directing Johnson to send letters to those customers accusing them of patent infringement. These allegations state a claim for unfair competition.

A concise statement of common law unfair competition as it relates to accusations of patent infringement is found in 55 *Am. Jur. 2d*, "Monopolies" § 700 (1971):

Charging a competitor's customers with patent infringement and refusing to sell to them is not unfair competition even though the charges prove false, where in-

fringement charges are made in good faith and it is believed that infringement would result from the use of that which is sold. [*Falcon Lock Co. v. Best Universal Lock Co.*, 362 F. 2d 221 (9th Cir. 1966).] On the other hand, bad-faith threats of patent infringement suits against persons using a competitor's product have been held actionable. [*Russo v. Thompson*, 294 Mass. 44, 200 N.E. 570 (1936).]

The general rule is that a patent holder has a right to protect his interest by notifying alleged infringers of his claims, even before a decree in his favor has been obtained. He may threaten suit against an alleged infringer but he must act in good faith, not attempt to injure a competitor's business, and confine himself to publicizing only the information necessary for his protection. 2 R. Callmann, *The Law of Unfair Competition, Trademarks, and Monopolies*, § 42.4 at 254-255 (3rd ed. 1968). In this Circuit, as in all other jurisdictions, bad faith is an essential element of unfair competition. *International Industries v. Farbach Chem. Co.*, 145 F. Supp. 34, 37 (S. D. Ohio, 1956), *affirmed*, 241 F. 2d 246, 248 (6th Cir. 1957); *Oil Conservation Engineering Co. v. Brooks Engineering Co.*, 52 F. 2d 783, 786 (6th Cir. 1931); *Alliance Securities Co. v. DeVilbiss Mfg. Co.* 41 F. 2d 668, 670 (6th Cir. 1930); *Callmann, supra*, § 42.4 at 255.

CPE's allegations state a claim for a type of unfair competition known as intentional interference with prospective contractual relations. The applicable law is provided by the Restatement (Second) of Torts §§ 766B, 767 and 773. *See Juhasz v. Quik Shops, Inc.*, 55 Ohio App. 2d 51, 9 Ohio Ops. 3d 216 (Summit County, 1977); *Reichman v. Drake*, 89 Ohio App. 222, 45 Ohio Ops. 444 (Hamilton County, 1951). These sections are set out below.

§ 766 B:

One who intentionally and improperly interferes with another's prospective contractual relation (except a con-



tract to marry) is subject to liability to the other for the pecuniary harm resulting from loss of the benefits of the relation, whether the interference consists of

(a) inducing or otherwise causing a third person not to enter into or continue the prospective relation or

(b) preventing the other from acquiring or continuing the prospective relation.

§ 767:

In determining whether an actor's conduct is intentionally interfering with a contract or a prospective contractual relation of another is improper or not, consideration is given to the following factors:

(a) the nature of the actor's conduct,

(b) the actor's motive,

(c) the interests of the other with which the actor's conduct interferes,

(d) the interests sought to be advanced by the actor,

(e) the social interests in protecting the freedom of action of the actor and the contractual interests of the other,

(f) the proximity or remoteness of the actor's conduct to the interference and

(g) the relations between the parties.

§ 773:

One who, by asserting in good faith a legally protected interest of his own or threatening in good faith to protect the interest by appropriate means, intentionally causes a third person not to perform an existing contract or enter into a prospective contractual relation with another does not interfere improperly with the other's relation if the actor believes that his interest may otherwise be impaired or destroyed by the performance of the contract or transaction.

Section 766B calls for a two step analysis. The first is to determine if there was intentional interference, and the second

is to determine if the interference was improper. As for the first step, we have no difficulty concluding that the infringement letters were sent for the purpose of inducing CPE's past and prospective customers not to purchase CPE equipment. Dr. Campbell directed Johnson to send the letters, and the letters expressly claimed infringement and demanded that the addressee cease using CPE equipment. It is quite reasonable to conclude that the intent and impact of these letters was to interfere with the continuing and prospective contractual relations between CPE and its customers.

To determine if the interference was improper we turn to the considerations directed by § 767. The conduct which actually interfered with CPE's contractual relations, sending the infringement letters, was direct and overt. The letters specifically charged infringement and threatened suit, however they did not specify what the nature of the alleged infringement was, indeed they did not identify CPE plants as the accused equipment. The failure to specifically accuse CPE equipment is undoubtedly due to the fact that Dr. Campbell wanted letters sent to the customers of Loughner as well as those of CPE, and Johnson used the same letter for each group of customers. Nevertheless, the letters are neither specific as to the equipment accused or the exact nature of the alleged infringement. The letters did not contain enough information to permit substantiation or verification by the addressees. Further, there was no evidence other than the letters that Dr. Campbell intended to bring suit over the alleged infringement.

Dr. Campbell's motive in sending the letters was ostensibly to protect his rights in the Gay patent. A review of the events of the eight years preceding the letters, however, provides a strong basis for a conclusion that Dr. Campbell was motivated by ill will and vindictiveness. After his disharmonic parting with Mc

Cartney and Loughner over the Pennsylvlucky operation in 1970 Dr. Campbell participated in two unsuccessful coal washing ventures, first Pisgah then Cinco. He lost substantial amounts of money; investors whom he had found for the ventures lost substantial amounts of money. At the same time Dr. Campbell was experiencing these failures, McCartney and Loughner were experiencing success. Both were manufacturing and selling coal washing plants for a growing industry. Dr. Campbell was undoubtedly jealous of this success, and was undoubtedly resentful as well because the success of McCartney and Loughner stemmed in part from the experimental efforts at the Pennsylvlucky plant, a plant which Dr. Campbell helped finance. The letter Dr. Campbell wrote to McCartney in June, 1970, which stated, "[c]ontrary to what you may or may not have heard most things including pigs usually pay off for me in one way or the other," is indicative of Dr. Campbell's bad motive. That the "pigs" reference may have been intended as a humorous remark does not belie Dr. Campbell's assertion that he intended to make his investments "pay off" no matter what the means. It is fair to conclude that he considered infringement accusations against CPE and its customers, which carried the hope of gaining some remuneration, a means of making his unsuccessful coal washing ventures "pay off." It is readily apparent that, while Dr. Campbell had no direct relation with McCartney for nearly eight years, he still harbored animus toward McCartney as a result of their prior association.

The interests of CPE that were interfered with by the infringement letters were substantial. CPE had an ongoing business that manufactured million dollar plants. Its reputation within the coal washing industry was obviously good prior to the letters because of the growth it had experienced. The infringement accusations had an immediate and substantial im-

pact on CPE's sales, reputation, and ability to continue in business. The interests that Dr. Campbell sought to advance by making the infringement accusations were small by comparison. These were of course the rights incident to the Gay patent. But these rights had relatively little value. Only two plants based on the Gay patent had been made, and only one of those had been sold. There was no evidence that Dr. Campbell intended any commercial or personal use of the Gay patent. The social interest in protecting Dr. Campbell's freedom to protect his patent rights pales in comparison to the social value of the contractual relations of CPE which were interfered with by Dr. Campbell's action.

As noted above, bad faith must be shown in order to prove an allegation of unfair competition stemming from accusations of patent infringement. This requirement is mirrored by Restatement section 773 which holds that a good faith assertion of an interest or a good faith threat to protect an interest does not amount to an improper interference into the contractual rights of another even if it intentionally causes a third person not to enter into a contractual relation.

Good faith refers to a state of mind and, in this context means that the speaker sincerely believes in the truth of his infringement accusation. Good faith is presumed until the contrary is established. Callmann, *supra*, § 42.4. Our review of the facts of this case and the considerations outlined in Restatement § 767 leads us to conclude that CPE has rebutted the presumption of good faith. Accusations of infringement must be made with extreme accuracy and caution, and, to the maximum extent possible, in such a manner that they may be substantiated and verified. Callman, *supra*. The infringement letters sent by Johnson did not meet this standard. Further, there was no evidence that Dr. Campbell stood ready to protect his rights in

the Gay patent by litigation. Rather, his threats of suit were empty gestures intended to injure CPE's business. Callman, *supra*.

Dr. Campbell's testimony that he relied on the advice of Reed and Johnson in sending the infringement letters, which could support an inference of good faith, was substantially undercut by the fact that neither Reed nor Johnson testified. It is a well-settled rule that if a party knows of the existence of an available witness on a material issue and such witness is within his control, and if, without satisfactory explanation, he fails to call the witness, the trier of fact may draw the inference that the testimony of the witness would not have been favorable to that party. 29 Am. Jur. 2d, Evidence § 180 (1967). Reed and certainly Johnson were within the control of Dr. Campbell in that they both had a relationship with Dr. Campbell—friendship, employment—that made it likely that their presence could have been procured by Dr. Campbell. *Id.* No explanation was offered for Reed's failure to testify. The explanation offered for Johnson's failure to testify, that his doing so would ultimately lead to Dr. Campbell's being without representation at trial, was not satisfactory. At the time this explanation was offered the Court stood ready to advise that Johnson could testify without having to resign as co-counsel because his refusal to testify or to continue as co-counsel would work a substantial hardship on his client. ABA Code of Professional Responsibility DR5-101(C)(4); S. D. Rule 2.4.7. The Court's advice was not sought.<sup>3</sup> The Absence of testimony by Messrs. Rozak, Lynch

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<sup>3</sup> This was not the only time Dr. Campbell's counsel failed to seek the Court's aid in the face of adverse circumstances. As noted in our findings of fact, Dr. Campbell's group was not permitted to take motion pictures at a CPE plant. Dr. Campbell's counsel never requested the Court's intervention in this regard. During trial the Court was asked to view the CPE plant in operation; the request was denied because the Court felt that doing so would be for the purpose

and Alpie, who supposedly advised Dr. Campbell during his investigation of the similarity of the CPE and Gay plants, and who appeared to be in the control of Dr. Campbell for evidentiary purposes, also weighs against an inference of good faith on the part of Dr. Campbell.

A number of the incidents described by Dr. Campbell in his testimony also militate against an inference of good faith on his part. First, his supposed reliance on the advice of Reed and Johnson seems at a minimum misplaced because neither was apparently skilled in the coal-washing art. Second, the trip Dr. Campbell and Reed took to the CPE plant near Connellsville, Pennsylvania, in November of 1977 seems more a charade than an investigation. From his trial testimony it was obvious that Dr. Campbell had sophisticated knowledge of the coal washing art; his choosing to stay in the car while Reed examined the plant seems more an attempt to maintain a facade of ignorance rather than an investigatory effort. Finally, Dr. Campbell's testimony that, at the time the infringement letters were sent, he did not know if the CPE equipment had the various devices that the Gay patent supposedly innovated is not credible in the light

Footnote 3 (Continued)

of gathering evidence. In a post-trial memorandum (doc. 70) Dr. Campbell's counsel requested that the trial record be reopened so that such motion pictures could be made and entered in the record. Such a request is, of course, addressed to the discretion of the trial judge, and should be granted only when the evidence to be gathered appears necessary to prevent injustice and is reasonably available. *Calage v. University of Tennessee*, 544 F. 2d 297 (6th Cir. 1976). As we noted in our decision denying the request (doc. 77), the evidence sought would just be cumulative. The memorandum of Dr. Campbell's counsel also suggested that the Court's reason for not viewing the CPE plant was inadequate by asserting that gathering evidence was "exactly what [a trier of fact] does when it makes a visit to . . . a location or building remote from the courthouse in a civil trial." This assertion is entirely incorrect. A view is not allowed for the purpose of gathering evidence, rather it is only for the purpose of aiding the trier of fact in its understanding of evidence admitted at trial. 75 Am. Jur. 2d Trial § 84 (1974).

of his level of knowledge in the coal washing art and in light of the fact that he compared the Gay patent (px 1) to CPE's detailed brochure (px 4).

In sum, we conclude from a preponderance of the evidence that Dr. Campbell intentionally and improperly interfered with CPE's continuing and prospective contractual relations with established and prospective customers by directing Johnson to send letters accusing infringement to those customers. Dr. Campbell was primarily motivated by ill will, not a desire to protect his patent rights, and he gave the directive without a good faith belief that infringement existed. Dr. Campbell has therefore committed unfair competition and is liable to CPE for all damages arising from his tortious conduct. As noted in the findings of fact, CPE did suffer damages as a result of Dr. Campbell's actions. The extent of CPE's damages was not pursued at trial because that issue had been severed for later resolution in the light of our liability determination. The discussion of damages in the findings of fact should not be considered as defining or limiting the scope of Dr. Campbell's liability

#### **D. Attorney fees**

CPE has requested that it be awarded attorney fees pursuant to 35 U.S.C. §285: "[t]he court in exceptional cases may award reasonable attorney fees to the prevailing party." CPE contends that Dr. Campbell has asserted the validity and infringement of the Gay patent in bad faith.

An award of attorney fees under § 285 must be based upon a specific finding that the case is an exceptional one because of fraudulent, malicious, inequitable or other bad faith conduct on the part of the losing party. *Park-Ohio Industries, Inc. v. Letica Corp.*, 617 F. 2d 450, 454 (6th Cir. 1980); *Campbell v. Spectrum Automation Co.*, 601 F. 2d 246, 251 (6th Cir. 1979); *Deyerle v. Wright Mfg. Co.*, 496 F. 2d 45, 55 (6th Cir. 1974); *Uniflow*

*Mfg. Co. v. King-Seeley Thermos*, 428 F. 2d 335, 341 (6th Cir. 1970), *cert. denied*, 400 U.S. 943 (1970); *Hoge Warren Zimmerman Co. v. Nourse & Co.*, 293 F. 2d 779, 784 (6th Cir. 1961). The request is addressed to the discretion of the Court, *Park-Ohio Industries, Inc. v. Letica Corp.*, 617 F. 2d at 454; *Hoge Warren Zimmerman Co. v. Nourse & Co.*, 293 F. 2d at 784, and can be granted only in regard to patent-related claims. If an action embodies both patent and nonpatent claims, attorney fees pursuant to § 285 cannot be allowed for the nonpatent claims. *Deyerle v. Wright Mfg. Co.*, 496 F. 2d at 55; *Monolith Portland Midwest Co. v. Kaiser Aluminum & Chem. Corp.*, 407 F. 2d, 288, 297 (9th Cir. 1969); *Time Mechanisms, Inc. v. Qonaar Corp.*, 194 USPQ 500, 509 (D. N.J. 1976); *cf. Alyeska Pipeline Corp. v. Wilderness Society*, 421 U.S. 240 (1975). Further, the focus must be on the conduct of the parties during the prosecution of the action, rather than their conduct prior to the filing of the action or the quality of their proof. *See Eltra Corp. v. Basic, Inc.*, 599 F. 2d 745, 758 (6th Cir. 1979), *cert. denied*, 444 U.S. 942 (1979).

In the context of the prosecution of this action we cannot conclude that Dr. Campbell or his counsel acted in bad faith or otherwise inequitably in regard to the patent-related claims of invalidity and infringement, even though Dr. Campbell acted in bad faith when asserting infringement in the letters to CPE and its customers. It was pointed out in argument that Dr. Campbell presented no evidence relevant to the infringement allegations regarding claims 6, 7 and 8 of the Gay patent. This lack of proof was the reason for the Court's directed verdict against Dr. Campbell on those claims. CPE had not been told that no evidence would be presented on claims 6, 7 and 8, and prepared and presented evidence showing no infringement of them as part of its case. While Dr. Campbell's failure to present proof



on some of his infringement allegations may have put an extra, unnecessary burden on CPE in the prosecution of this action, we do not think his failure rises to the level of injustice necessary to brand this action "exceptional" under 35 U.S.C. § 285.

### CONCLUSION

For the foregoing reasons we hold as follows:

1. The Hydromatic Modular, Multimedia Coal Washer manufactured and sold by plaintiff Coal Processing Equipment, Inc., does not infringe any claim of U.S. Letters Patent No. 3,926,787 (the Gay patent).

2. Each claim of U.S. Letters Patent No. 3,926,787 (the Gay patent) is invalid and void because of the patent applicant's failure to disclose the best mode contemplated for carrying out his invention at the time of his application.

3. Defendant Bobby C. Campbell is liable to plaintiff Coal Processing Equipment, Inc., for all damages to plaintiff arising from defendant's commission of tortious unfair competition against plaintiff.

4. The request of Plaintiff Coal Processing Equipment, Inc., for attorney fees pursuant to 35 U.S.C. §285 is denied.

There being no just reason for delay, the Clerk of Court will be directed to enter judgment on the above-described matters pursuant to Rule 54(b) of the Federal Rules of Civil Procedure. The Court will by later order schedule the necessary pretrial and trial for the purpose of determining unfair competition damages.

S/S David S. Porter

United States Senior District Judge

7/24/81

FILED  
JOHN D. LYTER, CLERK  
AUG 7 4 37 PM '81

U.S. DISTRICT COURT  
SOUTHERN DIST. OHIO  
WEST DIV. CINCINNATI

**UNITED STATES DISTRICT COURT  
SOUTHERN DISTRICT OF OHIO  
WESTERN DIVISION  
No. C-1-78-161**

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**COAL PROCESSING EQUIPMENT, INC.,**  
Plaintiff

v.

**BOBBY C. CAMPBELL**  
Defendant

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**ORDER**

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The issues of patent infringement, patent validity, liability for common law unfair competition, and liability for attorney fees under 35 U.S.C. § 285 in this action were tried to the Court on January 6, 7, 8, 21, 22, 23 and February 4, 5, 6, 11, 12, 1981—the issue of the amount of damages arising from any liability determination having been severed for later trial (doc. 48).

For the reasons set out in the opinion filed concurrently with this order, and because there is no just reason for delay, the Clerk of Court is directed to enter judgment as follows pursuant to Rule 54(b) of the Federal Rules of Civil Procedure:

1. The Hydromatic Modular, Multimedia Coal Washer

manufactured and sold by plaintiff Coal Processing Equipment, Inc., does not infringe any claim of U.S. Letters Patent No. 3,926,787 (the Gay patent).

2. Each claim of U.S. Letters Patent No. 3,926,787 (the Gay patent) is invalid and void because of the patent applicant's failure to disclose the best mode contemplated for carrying out his invention at the time of his application.

3. Defendant Bobby C. Campbell is liable to plaintiff Coal Processing Equipment, Inc., for all damages to plaintiff arising from defendant's commission of tortious unfair competition against plaintiff.

4. The request of Plaintiff Coal Processing Equipment, Inc., for attorney fees pursuant to 35 U.S.C. § 285 is denied.

So ordered.

S/S David S. Porter

United States Senior District Judge

JUDGEMENT ON  
DECISION BY THE COURT

FILED  
JOHN D. LYTER, CLERK  
AUG  
10 7 57 AM '81

U.S. DISTRICT COURT  
SOUTHERN DIST. OHIO  
WEST DIV. CINCINNATI

**UNITED STATES DISTRICT COURT  
FOR THE  
SOUTHERN DISTRICT OF OHIO  
WESTERN DIVISION**

**Civil Action File No. C-1-78-161**

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**COAL PROCESSING EQUIPMENT, INC.,**  
Plaintiff

v.

**BOBBY C. CAMPBELL**  
Defendant

---

**JUDGMENT**

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This action came on for trial before the Court, Honorable David S. Porter, United States District Judge, presiding, and the issues having been duly tried and a decision having been duly rendered,

It is Ordered and Adjudged that

- (1) The Hydromatic Modular, Multimedia Coal Washer manufactured and sold by plaintiff Coal Processing Equipment, Inc., does not infringe any claim of U.S. Letters Patent No. 3,926,787 (the Gay patent).

- (2) Each claim of U.S. Letters Patent No. 3,926,787 (the Gay patent) is invalid and void because of the patent applicant's failure to disclose the best mode contemplated for carrying out his invention at the time of his application.
- (3) Defendant Bobby C. Campbell is liable to plaintiff Coal Processing Equipment, Inc., for all damages to plaintiff arising from defendant's commission of tortious unfair competition against plaintiff.
- (4) The request of Plaintiff Coal Processing Equipment, Inc., for attorney fees pursuant to 35 U.S.C. § 285 is denied.

By order of the Court, this judgment is entered pursuant to Rule 54(b) of the Federal Rules of Civil Procedure.

Dated at Cincinnati, Ohio, this 10th day of August, 1981.

JOHN D. LYTER

Clerk of Court

S/S Elizabeth E. Schaeffer

Deputy Clerk

Nos. 81-3629 & 82-3069

**UNITED STATES COURT OF APPEALS  
FOR THE SIXTH CIRCUIT**

**ORDER**

FILED  
JUL 19 1983  
JOHN P. HEHMAN, Clerk

NOT RECOMMENDED FOR FULL TEXT PUBLICATION  
Sixth Circuit Rule 24 limits citation to specific situations. Please see  
Rule 24 before citing in a proceeding in a court in the Sixth Circuit. If  
cited, a copy must be served on other parties and the Court.  
*This notice is to be prominently displayed if this decision is reproduced.*

**COAL PROCESSING EQUIPMENT, INC.,**

**Plaintiff-Appellee,  
Cross-Appellant,**

v.

**BOBBY C. CAMPBELL**

**Defendant-Appellant,  
Cross-Appellee**

---

Before: ENGEL and CONTIE, Circuit Judges; and  
FEIKENS, Chief District Judge.\*

This patent infringement action arises out of United States  
Patent No. 3,926,787, which is owned by Appellant/Cross-  
Appellee Bobby C. Campbell. Campbell appeals from an order  
of the United States District Court for the Southern District of  
Ohio which held:

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\* The Honorable John Feikens, Chief Judge, United States  
District Court for the Eastern District of Michigan, sitting by  
designation.

- (1) that appellee/cross-appellant Coal Processing Equipment's Hydromatic Modular Multimedia Coal Washer did not infringe on Campbell's patent;
- (2) that Campbell's patent was invalid and void because of his failure "to disclose the best mode contemplated for carrying out his invention at the time of his patent application;"
- (3) that Campbell was liable to CPE for all damages to CPE caused by Campbell's unfair competition.

On appeal, Campbell argues that the district court erred in making the three conclusions of law listed above. CPE cross-appeals for attorneys' fees under 35 U.S.C. § 285 and for a declaration that the Campbell patent is void for obviousness under 35 U.S.C. §103.

For the reasons set forth in the comprehensive opinion of Senior United States District Judge David S. Porter filed in the district court on August 4, 1981 and amended by Judge Porter's order entered in the district court on September 14, 1981,

IT IS ORDERED that the judgment of the district court is in all respects AFFIRMED.

ENTERED BY ORDER OF THE COURT

S/S John P. Hehman

Clerk

ISSUED AS MANDATE: October 6, 1983

COSTS: None

A TRUE COPY

Attest:

JOHN P. HEHMAN, Clerk

By S/S Gary McCarthy

Deputy Clerk

Nos. 81-3629 & 82-3069

**UNITED STATES COURT OF APPEALS  
FOR THE SIXTH CIRCUIT**

FILED  
SEP 28 1983  
JOHN P. HEHMAN, Clerk

**ORDER**

**COAL PROCESSING EQUIPMENT, INC.,**  
Plaintiff-Appellee,

v.

**BOBBY C. CAMPBELL**  
Defendant-Appellant.

---

Before: ENGEL and CONTIE, Circuit Judges; and  
FEIKENS, Chief District Judge.\*

No judge in the active service of the court having requested a vote on the petition for rehearing en banc filed on behalf of appellant and cross-appellee Bobby C. Campbell, that petition was referred to the panel which originally heard the appeal. Upon consideration, the panel being of the opinion that the petition raises no issues not already adequately covered by the opinion of the district court, which this court accepted as dispositive of the case,

IT IS ORDERED that the petition for rehearing en banc is denied.

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\* The Honorable John Feikens, Chief Judge, United States District Court for the Eastern District of Michigan, sitting by designation.



Costs are to be taxed against appellant and cross-appellee Bobby C. Campbell whose objections thereto have been considered and are overruled.

ENTERED BY ORDER OF THE COURT

S/S John P. Hehman

Clerk

APPENDIX B



3926787

**THE UNITED STATES OF AMERICA**

**TO ALL TO WHOM THESE PRESENTS SHALL COME**

Whereas, there has been presented to the  
Commissioner of Patents and Trademarks

A PETITION PRAYING FOR THE GRANT OF LETTERS PATENT FOR AN ALLEGED  
NEW AND USEFUL INVENTION THE TITLE AND DESCRIPTION OF WHICH ARE CON-  
TAINED IN THE SPECIFICATIONS OF WHICH A COPY IS HEREUNTO ANNEXED AND  
MADE A PART HEREOF, AND THE VARIOUS REQUIREMENTS OF LAW IN SUCH CASES  
MADE AND PROVIDED HAVE BEEN COMPLIED WITH, AND THE TITLE THERETO IS,  
FROM THE RECORDS OF THE PATENT AND TRADEMARK OFFICE IN THE  
CLAIMANT(S) INDICATED IN THE SAID COPY, AND WHEREAS, UPON DUE EXAMI-  
NATION MADE, THE SAID CLAIMANT(S) IS (ARE) ADJUDGED TO BE ENTITLED TO  
A PATENT UNDER THE LAW.

NOW, THEREFORE, THESE Letters Patent ARE TO GRANT UNTO THE SAID  
CLAIMANT(S) AND THE SUCCESSORS, HEIRS OR ASSIGNS OF THE SAID CLAIMANT(S)  
FOR THE TERM OF SEVENTEEN YEARS FROM THE DATE OF THIS GRANT, SUBJECT  
TO THE PAYMENT OF ISSUE FEES AS PROVIDED BY LAW, THE RIGHT TO EXCLUDE  
OTHERS FROM MAKING, USING OR SELLING THE SAID INVENTION THROUGHOUT THE  
UNITED STATES.

In testimony whereof I have hereunto set my  
hand and caused the seal of the Patent and  
Trademark Office to be affixed at the City  
of Washington this sixteenth day  
of December, in the year of our Lord one  
thousand nine hundred and seventy-five,  
and of the Independence of the United States  
of America the two hundredth

*Attest*  
J. J. Gibson  
Acting Officer

*C. Marshall Dunn*  
Commissioner of Patents and Trademarks

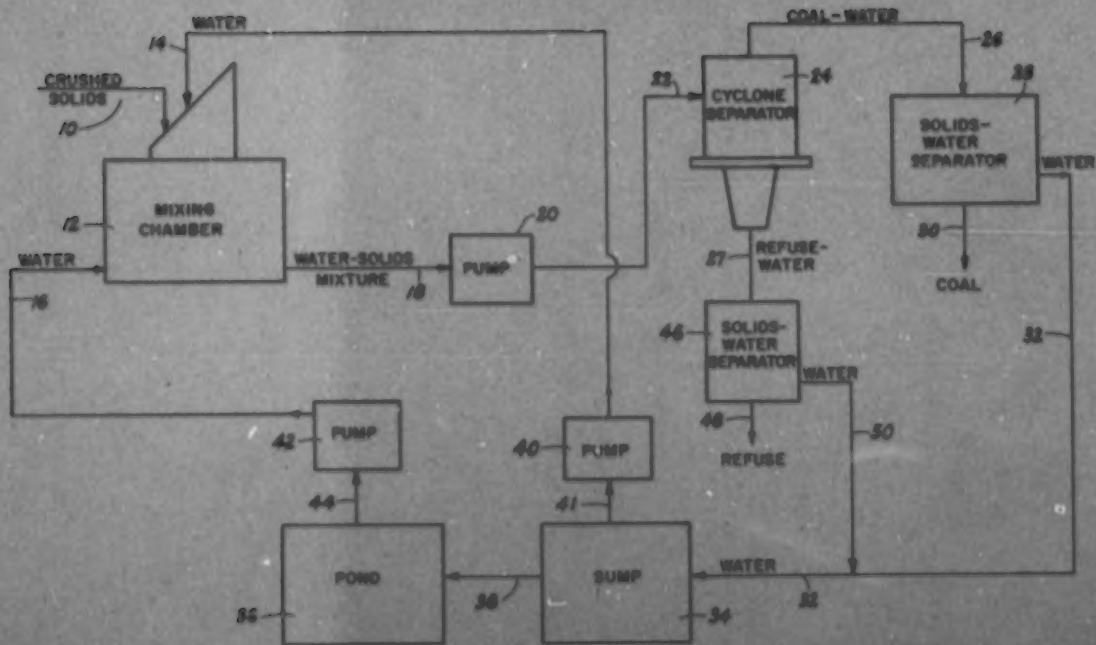


Fig. 1

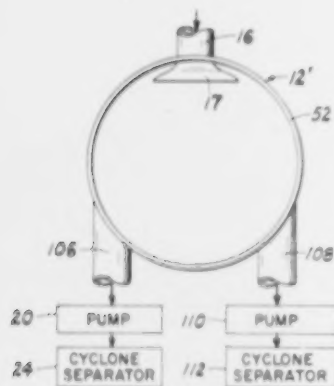


Fig. 7

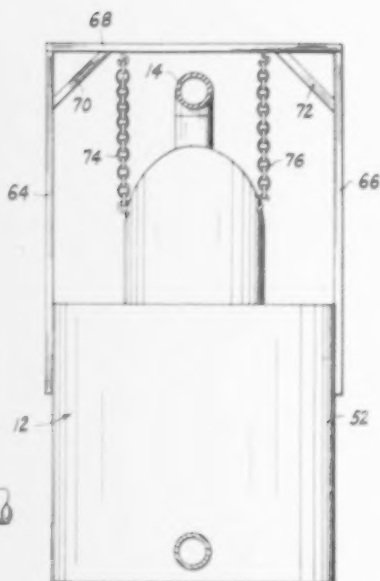


Fig. 2

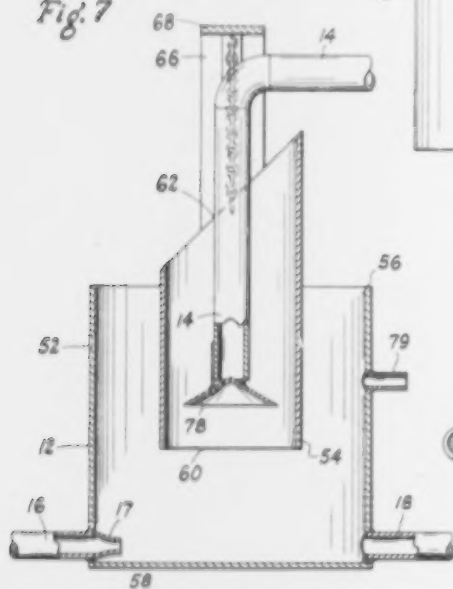


Fig. 3

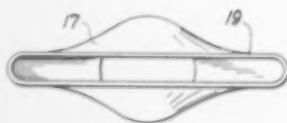


Fig. 4



Fig. 6

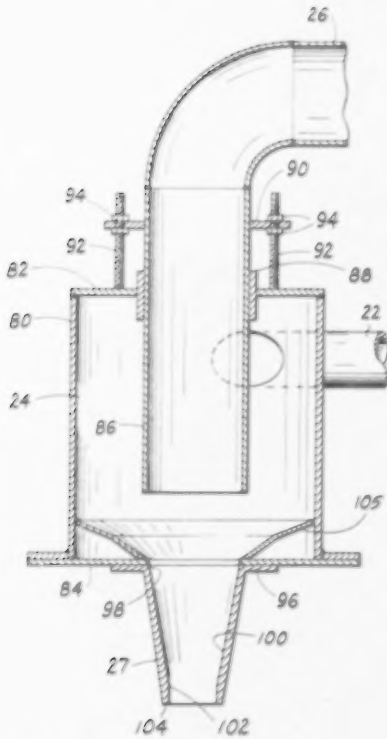


Fig. 5

# United States Patent [19]

Gay

[11] 3,926,787

[45] Dec. 16, 1975

## [54] METHOD AND APPARATUS FOR REDUCING SULPHUR AND ASH CONTENT OF COAL

[75] Inventor: Larry T. Gay, Frostburg, Md.

[73] Assignee: C-G Process Coal Company, Tulsa, Okla.

[22] Filed: Mar. 2, 1973

[21] Appl. No.: 337,590

[52] U.S. Cl. 209/3; 209/211; 259/18

[51] Int. Cl.<sup>2</sup> B04C 9/00

[58] Field of Search 209/211, 3; 259/4, 18

### [56] References Cited

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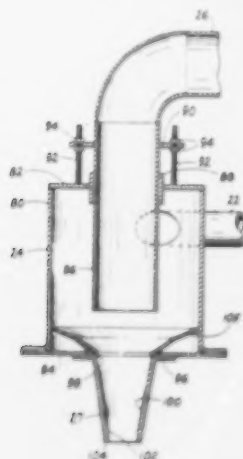
815,247	7/1937	France	259/4
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Primary Examiner—Frank W. Lutter  
Assistant Examiner—Ralph J. Hill  
Attorney, Agent, or Firm—William S. Dorman

## [57] ABSTRACT

A method and apparatus for reducing sulphur and ash content of a solid material containing coal to a commercially usable product or to a commercially improved product by treating a pre-crushed and pre-screened quantity of the starting material in a size range of  $1\frac{1}{4} \times 0$  inches, the so-crushed and so-screened starting material is fed through a mixing chamber where it is mixed with a quantity of water under prescribed conditions of pressure and turbulence to create a proper solids-water mixture; thereafter, the resulting solids-water mixture is conveyed to a cyclone separator under a predetermined pressure; the solids-water mixture is introduced tangentially into said cyclone separator which contains a vertically adjustable vortex finder which extends vertically upwardly out of the cyclone separator; the cyclone separator is also provided, adjacent its bottom, with three cones of successively decreasing cone angles, the size of the inlet pipe to the cyclone separator, the size of the separator itself, the cones, the size and location of the vortex finder and the size of the nozzle at the lower end of the cyclone separator are all interrelated and important for achieving the results desired. The method and apparatus will serve to reduce the sulphur and ash content in many different types of coal containing solids. In certain types of coal, the sulphur content can be reduced to a point where it will pass the standards of the Environmental Protection Administration where the initial product would not.

8 Claims, 7 Drawing Figures



3,926,787

1

# METHOD AND APPARATUS FOR REDUCING SULPHUR AND ASH CONTENT OF COAL

## BACKGROUND OF THE INVENTION

### 1. Field of the Invention

The present invention relates to a method and apparatus for treating a solid coal-containing material to make a commercially salable or commercially more salable product therefrom. More particularly, the present invention involves a method and apparatus especially designed to reduce the sulphur and ash content of a solid coal-containing material.

### 2. Description of the Prior Art

Many methods and apparatus have been proposed and put to use for the purpose of treating solid coal-containing materials. Some of these involve crushing and screening alone. Some of these involve chemical treatment. Some of these involve suspending the solid coal-containing material in a liquid and treating the resulting mixture in a hydrocyclone. However, none of the prior art methods and apparatus recognize the interdependence between the mixing step and apparatus and the separating step and apparatus as taught in the present invention, nor does the prior art specifically teach the details of the separating cyclone as set forth and described in the present application.

## SUMMARY OF THE INVENTION

A quantity of coal-containing solid material is taken from a gob pile, for example, crushed and screened. A resulting feed from this quantity having a particle size of  $1\frac{1}{4} \times 0$  inches is introduced into the apparatus of the present invention. The first part of the apparatus involves a mixing chamber which includes a substantially cylindrical tank in which is suspended an open ended cylinder of substantially one-half the diameter of the mixing tank itself. Approximately 48 to 62 tons per hour of solid material are introduced into the center of the cylindrical member. At the same time, approximately 625 gallons per minute of water are introduced into this cylindrical member intermediate the ends thereof to create a condition of turbulence which is effected by the pressure of this stream of water and the restriction at the lower end of the conduit through which this water is introduced. A second stream of water is introduced adjacent the bottom of the cylindrical mixing tank under substantially more quiescent conditions. This second volume of water is introduced at approximately 600 gallons per minute. A combined effluent of approximately 1225 gallons per minute of water-containing solids is removed from the bottom of the mixing chamber and introduced tangentially adjacent the upper end of the cyclone separator.

The cyclone separator has a vortex finder of approximately eight inches in internal diameter, whereas the internal diameter of the cyclone separator is about 18 $\frac{1}{2}$  inches. The lower end of the vortex finder is spaced about 6 to 6 inches above the bottom of the cyclone separator. However, the vortex finder is adjustable by virtue of an adjustment means on the top of the cyclone separator. The bottom of the cyclone separator is provided with two conical members located above the bottom and a third conical member located below the bottom and terminating in a nozzle of about 3.5 inches in diameter. The three cones have successively decreasing angles of generation, to-wit, 68°, 53° and 7°. A product,

2

taken off the top of the cyclone separator through the vortex finder, is relatively rich in coal. A refuse, withdrawn from the bottom of the cyclone separator, is relatively poor in coal. The coal-containing product is passed through a fine screen where the water is removed and the coal product recovered. The same is done with the refuse to remove the water therefrom although the refuse is discarded. The water recovered from the latter two screening operations is recycled back to a sump for re-introduction into the mixing chamber.

In a second and preferred embodiment of the invention, the mixing chamber is adapted to feed two cyclone separators, each identical with the cyclone separator referred to above. Of course, the solid feed to the mixing chamber must be doubled and the quantity of water fed to the mixing chamber must also be doubled. In the operation of the mixing chamber for this second embodiment, the water introduced adjacent the bottom is substantially the same as that described in the first embodiment, however, the water introduced through the upper conduit is increased from about 625 gallons per minute to about 1900 gallons per minute. The effluent is withdrawn from the mixing chamber through two pipes tangentially disposed on opposite sides of the mixing tank and the solids-water mixture is withdrawn in a direction opposite from the introduction of the water to the bottom of the mixing chamber. Two pumps are provided to supply equal quantities of solid-water mixture to the two cyclone separators. The remainder of the operation of the second embodiment is substantially the same as that described above in relation to the first embodiment.

## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a flow sheet or diagrammatic representation of the overall process involved in the present invention; FIG. 2 is a right side elevation of the one embodiment of the mixing chamber diagrammatically illustrated in FIG. 1;

FIG. 3 is a vertical section view taken along section line 3-3 of FIG. 2;

FIG. 4 is an elevation, on an enlarged scale, of the flow spreader shown in FIG. 3;

FIG. 5 is a vertical cross sectional view through the cyclone separator of the present invention;

FIG. 6 is a vertical cross sectional view of the dish which is employed at the lower end of the cyclone separator; and

FIG. 7 is a view of another embodiment of the mixing chamber diagrammatically illustrated in FIG. 1.

## DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIG. 1, a quantity of crushed solids 10, such as from a gob pile (not shown), is introduced into the upper end of a mixing chamber 12. The crushed solids 10 from the gob pile are preferably pretreated using conventional crushing and screening operations so that the size of the feed is about  $1\frac{1}{4} \times 0$  inches. Preferably, the raw material is manually inspected on a picking conveyor or table (not shown) to remove large chunks of slate, rock or other refuse prior to the crushing and screening operations.

A first quantity of water is introduced into the top of the mixing chamber through the conduit 14. A second quantity of water is introduced into the bottom of the mixing chamber through a conduit 16. The water-solids

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mixture is removed from the bottom of the mixing chamber through the conduit 18. The water-solids mixture is pumped by means of a pump 20 into a conduit 22 which discharges tangentially into the upper end of a cyclone separator 24 to establish a vortex zone concentrically within the cyclone separator. A coal-water fraction is removed from the top of the cyclone separator 24 through the conduit 26. A refuse-water fraction is removed from the bottom of the cyclone separator 24 through the conduit 27.

The coal-water fraction from the cyclone separator 24 is fed by the conduit 26 to a solids-water separator 28 which is preferably in the form of an inclined (Heyl-Patterson) de-watering screen (the details of which are now shown). Crushed coal is discharged from the solids-water separator 28 at 30 from which point it can be conveyed into a coal pile (not shown) or directly into a rail car (not shown). The water which drains from the solids-water separator is conveyed by means of conduit 32 to a sump 34. Water from the sump 34 is conveyed to a pond 36 through a conduit 38.

Water from the sump 34 is directed to a pump 40 through a conduit 41. The discharge of the pump 40 is the conduit 14, previously described, which supplies water to the upper end of the mixing chamber 12. Another quantity of water is conveyed from the pond 36 to another pump 42 through the conduit 44. The discharge of this pump 42 is a conduit 16, previously described, which feeds water into the bottom of the mixing chamber 12.

The refuse-water fraction is introduced into a solids-water separator 46 through the conduit 27, previously described. The solids-water separator 46 is also preferably in the form of an inclined de-watering screen (not shown) similar to the solids-water separator 28, previously described. Refuse is discharged from the solids-water separator 46 at 48 from which point it can be discarded or otherwise conveyed to a refuse pile (not shown). Water drains from the solids-water separator 46 and is conveyed therefrom by means of a conduit 50 which joins with the conduit 32 to introduce additional water into the sump 34.

#### THE MIXING CHAMBER

The mixing chamber 12 shown in detail in FIGS. 2 and 3 is designed for operation in conjunction with a single cyclone separator 24 and includes a 6 foot diameter outer pipe or tank 52, a 3 foot diameter intermediate pipe 54 and an inner 6 inch pipe 14 (previously described), both of the latter being supported concentrically within the tank 52 as will hereinafter appear. The upper end 56 of the tank 52 is open and the lower end thereof is closed by a flat plate 58. The lower end 60 of the pipe 54 is spaced between twelve and sixteen inches above the bottom 58 of the tank 52. The upper end of the pipe 54 is inclined as at 62.

A pair of steel rods or pipes 64 and 66 are arranged in vertical parallel relationship and welded to the opposite sides of the outer tank 52 as best shown in FIG. 2. The upper ends of the rods 64 and 66 are connected by a steel cross member 68 and reinforced by inclined frame members 70 and 72. The frame structures consisting of members 64, 66, 68, 70 and 72 are suitably welded together and also welded to the tank, as indicated above. A pair of chains 74 and 76 are connected at their upper ends to the cross member 68 and at their lower ends to the upper side edge of the inner pipe 54. The chains 74 and 76 permit vertical adjustment of the

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lower end of the inner pipe 54 with respect to the bottom 58. These chains also permit a free swinging movement of the inner pipe 54, as desired, to prevent any possible clogging of solid material in the chamber 12.

As best shown in FIG. 3, crushed solids are introduced into the inner pipe 54. The inclined upper edge 62 is higher on the side opposite from the direction of feed to prevent solids from spilling over into the annular space between pipes 52 and 54. Conduit 14 which delivers water from the pump 40 goes through a right angle bend immediately below the cross member 68. The lower end of the pipe 14 is provided with a flare or cone 78 as indicated in FIG. 3. The cone 78 is imperforate, has a 12 inch outer diameter, and has a sixty degree cone angle. The upper surface of the cone is spaced one-half inch below the lower end of the pipe 54 and is held in position by rods (not shown) welded to the side of the pipe 14 and to the upper surface of the cone. The positioning of this cone 78 at the bottom of the pipe 14 causes two effects (a) the restriction of flow from the pipe 14 with the attendant increase in pressure therein, namely, the 65 p.s.i. referred to above and (b) a flaring out of the water stream issuing out of the bottom of the pipe 14. These two effects create a considerable turbulence in the pipe 54 and in the tank as well to facilitate the mixing and suspension of the solid particles in the liquid.

Approximately 48 to 62 tons per hour (depending upon the quantity of coal continued in the solid feed) are introduced into the inner pipe 54 as shown in FIG. 3. Approximately 625 gallons per minute of water at 65 pounds per square inch pressure are introduced into the mixing chamber 12 through the conduit 14. Another 600 gallons per minute of water are introduced into the mixing chamber 12 through the conduit 16 at approximately 2 to 5 pounds per square inch pressure. Approximately 1225 gallons per minute of water containing solid mixed therein, are removed from the mixing chamber through the conduit 18 and pumped into the cyclone separator through the conduit 22 by means of the pump 20 at a pressure of 4 to 6 p.s.i.

The pipe 16 is arranged to introduce water from the pond radially into the bottom of the tank 52. However, to provide a gentler flow and more even distribution at the end of the pipe 16, the latter terminates within the tank in a flow spreader 17 which is provided with an elongated opening 19 approximately 1 1/4 inches high and 18 inches long as best shown in FIG. 4.

The tank 52 is approximately 6 feet high. An overflow 79 is located about 2 feet below the upper edge of the tank to prevent filling of the tank above this point. The lower end of the pipe 14 terminates about 18 inches below the level of the overflow. The capacity of the tank to the overflow is about 840 gallons. The volume of solid-water mixture removed from the conduit 18 per minute therefore is about 1 1/4 times the capacity of the tank.

#### THE CYCLONE SEPARATOR

The cyclone separator 24 is shown in detail in FIGS. 5 and 6. The cyclone separator 24 includes an outer cylindrical member 80 which is closed at its top 82 and at its bottom 84. The cylindrical member 80 is a 20 inch standard pipe having an internal diameter of about 18 1/2 inches and an internal height of about 20 inches. A vortex finder 86 is supported concentrically within the cylinder 80. The vortex finder 86 has an 8 inch internal diameter and about an 8.5 inches external diameter. The



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lower end of the vortex finder is spaced about 6 to 8 inches above the bottom 84 of the separator 24. As indicated heretofore approximately 1225 gallons per minute of water containing suspended or mixed solids is introduced into the separator 24 through the conduit 22 to establish a vortex zone concentrically within the separator. Preferably the mixture contains about 15% solids and 85% water. The conduit 22 is a 6 inch pipe, the center of which is spaced about 5 inches from the top 82 of the cylindrical member 80.

The vortex finder 86 passes through the upper end 82 of the cyclone separator 24 and is maintained in sealed relationship with respect to the top by means of a circular gasket 88. A circular flange 90 is connected adjacent the upper end of the vortex finder 86 and it has therein a plurality of holes through which pass a plurality of threaded rods 92, the latter being welded or otherwise secured at their lower ends to the upper plate 82 of the cylinder 80. Threaded nuts 94, 94, spaced above and below the flange 90 permit the vertical adjustment of the vortex finder 86.

The lower discharge 27 from the cyclone separator 24 is in the form of a conical nozzle having an upper flat flange 96 which is welded or otherwise secured to the lower flat plate 84. The upper end of the discharge nozzle 27 has an internal opening of about 7 inches in diameter. The internal surface 100 of the nozzle 27 tapers gradually downwardly from the upper opening 96 to a point 102 located about 1 1/4 inches from the bottom 104 of the nozzle 27. The diameter at this point from 102 to the bottom 104 is approximately 3 1/4 inches. The total height of the nozzle 27 is approximately 1 1/4 inches.

Located immediately above the bottom plate 84 is a tapered dish 105 best shown in FIG. 6. The dish 105 is preferably about 1/4 inch thick and has a vertical height of approximately 3 1/4 inches. The upper external diameter of the dish 105 is preferably about 18 1/2 to 18 3/4 inches in diameter so as to fit with a very small amount of clearance inside the internal diameter of the cylinder 80 which, as previously indicated, has an internal diameter of approximately 18 1/2 inches. The upper end of the dish 105 has an opening 107 of a diameter slightly less than the external diameter referred to above. The internal surface of the dish 105 is represented by the combined internal surfaces of two conical members 111 and 113 which intersect along a circular line 114. As shown in FIG. 6, the horizontal diameter of the internal surface at the line 114 is approximately 13 inches. The side of the cone 111 from the opening 107 to the circular line of intersection 114 extends (as measured along the side of the cone 111) approximately 3 1/4 inch and the angle that the side of the cone 111 bears with respect to a horizontal plane is approximately 22°.

The second cone 113 extends downwardly from the circular line of intersection 114 to a bottom opening 116 which is approximately 7 1/4 inch in diameter. The distance from the circular line 114 to the opening 116 measured along the side of the cone 112 is approximately 3 1/4 inch and the angle that the cone 113 makes with the horizontal plane is approximately 37°.

It will appear from the above that the lower end of the separator terminates in three zones formed by three intersecting cones. The upper cone 111 has an angle (of generation) of about 68°; the intermediate cone 113 about 53°; and the lower cone 100 slightly less than 7°.

The internal vertical height of the cyclone separator 24 is approximately 20 inches. As indicated heretofore, approximately 1225 gallons per minute of liquid containing solid particles therein is introduced into the cyclone separator 24 through the pipe 22 at approximately 4 to 6 p.s.i. If it turns out that the percentage of larger particles increases in the feed, then the vortex finder 86 is moved downwardly.

#### THE MODIFIED MIXING CHAMBER

In contrast to the mixing chamber 12 previously described in relation to FIGS. 2 and 3, the mixing chamber 12' shown in FIG. 7 is designed for operation in conjunction with two cyclone separators each substantially identical to the cyclone separator 24 illustrated in FIGS. 5 and 6. More particularly, the modified mixing chamber 12' includes the same tank 52 with the same dimensions previously set forth, the same inner pipe 54, the same inlet pipe 14, etc. The only differences between the structure of FIGS. 2 and 3 and FIG. 7 are in (a) the spacing between the cone 78 and the bottom of the pipe 14 and (b) the replacement of the single discharge pipe 18 of FIGS. 2 and 3 with two tangentially located discharge pipes 106 and 108 in FIG. 7.

As to the first difference referred to above, since each cyclone separator will be fed approximately 1225 gallons per minute this will represent a total outflow of 2500 gallons per minute from pipes 106 and 108. Again, the water flowing through the pipe 16 and flow spreader 17 will remain the same, namely, 600 gallons per minute. This means that the water flowing from the sump 34, through the pipe 40 and through the pipe 14 will increase from 625 gallons per minute to 1900 gallons per minute. The spacing between the cone 78 and the pipe 14 will have to be increased for the FIG. 7 modification. It was determined that a vertical spacing of 1 inch between the cone 78 and the bottom of the pipe 14 would be adequate for the purpose of FIG. 7 while still maintaining the 65 p.s.i. in the pipe 14. Of course, it should be understood that the solids fed to the mixing chamber would have to be doubled; thus for the FIG. 7 operation the solids feed into the pipe 54 would be 96 to 124 tons per hour, again depending upon the quantity of coal contained in the feed as well as its ease of separation.

As far as the second difference is concerned, it will appear that FIG. 7 shows two outlet pipes 106 and 108 which are arranged tangentially with respect to the bottom of the tank 52 and on the opposite side thereof from the flow spreader 17. This arrangement is designed to balance the outflow of the two cyclone separators. Pipe 106, for example, can connect with the pump 20 which feeds the cyclone separator 24 previously described. Pipe 108 can feed to a pump 110, identical to pump 20, which, in turn, feeds cyclone separator 112 which is identical to cyclone separator 24. The total volume of solids-water mixture removed from the tank per minute through the pipes 106 and 108 is roughly 3 times the capacity of the tank itself.

The cyclone separators 24 and 112 of FIG. 7 would each feed to two solids-water separators such as separators 28 and 46, one for the coal product and one for the refuse. The water drained from the two separators 28 would be combined to feed a single sump 34 as would be the water drained from the separators 46. Similarly, the products of the cyclone separators 24, 112 could be combined and so also could the refuse. It is contemplated, therefore, that the arrangement of FIG. 7 would

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involve a single pump, such as pump 40 to supply water from the sump 34 to the conduit 14; also a single pump, such as the pump 42 to supply water from the pond 36 to the pipe 16.

### EXAMPLE I

About 800 tons of non-salable coal was taken from a gob pile near Johnstown, Pa. The material appeared to contain a large quantity of pyrites, principally in the binder. This non-salable coal was passed through the preliminary crushing and screening steps referred to above so that the raw material fed to the process and apparatus of the present invention was  $1\frac{1}{4} \times 0$  inches. The process and apparatus employed in this example was the embodiment shown and described in relation to FIG. 7. The feed analyzed as follows:

#### Analysis of Feed

	As Received	Dry Basis
Moisture	7.99	
Volatiles Matter	13.86	15.08
Fixed Carbon	48.29	52.8
Ash	29.87	32.48
Sulphur	100.00%	100.00%
BTU. (Calorimeter)	3.90	6.14
BTU. (Moisture Ash Free)	0.010	9.791
		14.497

The raw feed was further analyzed as to different particle sizes as appears below:

#### Analysis of $1\frac{1}{4}$ inches $\times$ 0 inch Raw Feed

Size	Screen Test %	Ash	Air Dry % Sulphur
$1\frac{1}{4}$ inches $\times$ $\frac{1}{2}$ inch	5.73	61.36	4.29
$\frac{1}{2}$ inch $\times$ $\frac{1}{4}$ inch	6.07	48.77	5.05
$\frac{1}{4}$ inch $\times$ $\frac{1}{8}$ inch	13.81	40.22	4.99
$\frac{1}{8}$ inch $\times$ 28 Mesh	53.29	24.73	3.88
28 Mesh $\times$ 0	21.10	27.47	2.68

The 800 tons of material described above were processed through the equipment shown in the drawings. The product of about 682 tons was removed at 30 from FIG. 1. The recovered product was tested and analyzed as follows:

#### Analysis of Product

	As Received	Dry Basis
Moisture	10.58	
Volatiles Matter	15.26	17.06
Fixed Carbon	65.16	72.87
Ash	0.00	10.07
Sulphur	100.00%	100.00%
BTU. (Calorimeter)	0.99	1.11
BTU. (Moisture Ash Free)	12.335	13.795
		15.340

The product was further analyzed according to the different particle size and the analysis was as follows:

#### Analysis of Product by Particle Size

Size	Screen Test %	% Ash	Air Dry % Sulphur
$1\frac{1}{4}$ inches $\times$ $\frac{1}{2}$ inch	5.55	13.79	1.50
$\frac{1}{2}$ inch $\times$ $\frac{1}{4}$ inch	15.19	11.18	1.12
$\frac{1}{4}$ inch $\times$ $\frac{1}{8}$ inch	19.27	9.22	1.01
$\frac{1}{8}$ inch $\times$ 28 Mesh	46.37	7.70	0.99
28 Mesh $\times$ 0	10.62	17.94	1.72

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Finally, the refuse was passed through a float-sink test to determine the quantity of ash and sulphur remaining therein. The refuse tested as follows:

#### Float-Sink Test of Refuse

Float at 1.40 Sp. Gr.	37.82%
Sink at 1.40 Sp. Gr.	62.17%
Sink at 1.40 Sp. Gr.	Air Dry Ash 67.59%
Sink at 1.40 Sp. Gr.	Air Dry Sulphur 10.22%

From the above, it should appear that the initial feed had an ash content of 29.87% and a sulphur content of 3.99%; this was reduced by virtue of the process to 9% ash and 0.99% sulphur. The product was a salable coal.

### EXAMPLE II

The following example involves the treatment of a gob pile from a red stone seam in Maryland. The feed is characterized by having a high ash and high sulphur content, the coal itself has an inherent sulphur content. Again, the preferred embodiment of FIG. 7 was employed in this example.

#### Analysis of Feed

	As Received	Dry Basis
Moisture	1.36	
Volatiles Combustible Matter	14.58	14.78
Fixed Carbon	86.71	61.55
Ash	23.35	23.67
Sulphur	4.09	4.15
BTU. as received	11.671	
BTU. dry	11.832	
BTU. M. & A. Free	15.501	
Fusion A.S.T.M. Softening Point	2560°F	
Free Swelling Index A.S.T.M.	No. 8	
Moisture	0.87	
Volatiles Combustible Matter	15.62	15.76
Fixed Carbon	67.30	67.89
Ash	16.21	16.35
Sulphur	2.38	2.40
BTU. as received	12.867	
BTU. dry	12.980	
BTU. M. & A. Free	15.517	
Fusion A.S.T.M. Softening Point	2380°F	
Free Swelling Index A.S.T.M.	No. 9	

From the above it will appear that the ash content was reduced from 23.35 to 16.21 and the sulphur was reduced from 4.09 to 2.38. Whereas the feed itself was non-salable, the product is a salable product under certain conditions. If the percentage of sulphur is higher than the requirements allow, this coal can be mixed with a product having a low sulphur content so as to bring the average down within acceptable limits.

### FURTHER DESCRIPTION

All of the pipes for handling liquids or solids-liquids mixture are 6 inch pipes except for the discharge 26 from the cyclone separator 24; as previously described, this discharge pipe 26 is an 8 inch pipe. The conduit 60 which connects with the outer end of the pipe 26 to the solids water separator 28 has to be somewhat flexible in view of the fact that the lower end of this pipe 26, which is the vortex finder, has to be adjustable; therefore, the connecting conduit from the pipe 26 to the separator 28 is a flexible conduit slightly larger in size than the eight inch pipe. Of course, the discharge cone 27 from the cyclone separator 24 has a lower opening which is  $3\frac{1}{4}$  inches in diameter.

The pressure in the pipe 14 and the turbulence created at the bottom of the pipe 14 is important to the operation of the process so as to keep all of the solids in suspension in the mixing chamber 12. The pump 20 is what is commonly referred to as a "trash pump" which is capable of handling mixtures of solids and liquids. The trash pump 20 has a standard housing but has a specially built impeller capable of passing material 3 inches in diameter. The same considerations hold true from the pump 110 shown in FIG. 7. Each trash pump 20 or 110, is provided with a variable speed electric drive such that the speed of the pumps can vary as the percentage of coal varies in the gob pile.

As indicated heretofore, the solids-liquid suspension fed to the cyclone separator 24 preferably has about 15% solids and 85% water. When treating a gob bank where the percentage of coal in the solids is relatively lower, the percentage of solids in suspension can run as high as between 20 and 30 per cent. However, in operating from a strip mine where the percentage of coal is relatively high, then 15% solids in the solids-water mixture to the cyclone separator is adequate. The pressure in the conduit 22 is important and should be in the range of 4 to 6 p.s.i. For example, if the flow through the conduit 22 is 875 gallons per minute the pressure can fall as low as 4 p.s.i., conversely, if the flow is 1225 gallons per minute or slightly higher, then the pressure should be about 6 p.s.i. The 6 inch inlet pipe 22 compares with the diameter of 18 1/2 inch of the cyclone 24 which means that the cross sectional area of the pipe 22 is between 1/9 and 1/10 of the cross sectional area of the cyclone separator 24.

The cyclone separator 24 (or 112) is designed to create three separating zones formed by the cones 110, 112 and 100. The upper chamber whose lower end is formed by the cone 110 is designed to create a specific gravity to make the 1 1/4 to 4 inch material enter towards the center of the core. The second zone formed by the cone 112 is designed to handle the 3/4 to 3/2 inch material and make it enter towards the center of the chamber of the cyclone. The last zone formed by the cone 110 is designed to handle the 3/4 to 0 inch material and make it enter towards the center of the cyclone, and at that point a suction is created by the cyclone which sucks up the center core of the cyclone sucking the coal 1 1/4 inch all the way down to zero material out the top of the cyclone 26.

If, in the operation of the mixing chamber 12, it appears that liquid is passing out of the overflow 79 the quantity of liquid entering through the conduit 16 can be reduced to prevent this overflow.

Whereas the present invention has been described in particular relation to the recovery of a salable coal product from a gob bank, obviously, the method and apparatus of the present invention could be employed in conjunction with the mining of coal directly, for example, from a strip mine, where it is desired to improve the quality of the coal.

As far as the mixing chamber is concerned, the outer tank 12 has a diameter of approximately 6 feet and the inner pipe 54 has a diameter of about 3 feet. The cross sectional area of the pipe 54 is therefore, roughly, one to four, or, stated somewhat differently the cross sectional area of the pipe 52 is about one-third of the annular area between the pipe and the tank. The pressure of the water entering the conduit 14 is preferably about 65 p.s.i. and the water issuing from the bottom of the pipe 14 between it and the core 78 creates a condition

of turbulence which is essential to the operation of the mixing chamber 12 and to the entire process. When operating the mixing chamber using the single cyclone separator, the input of solids is 48 to 62 tons per hour as compared to a total water input of 1225 gallons per minute. This relationship reduces roughly to 1.3 to 1.7 pounds of coal per gallon of water.

Whereas the present invention has been described in particular relation to the drawings attached hereto, it should be understood that other and further modification, apart from those shown or suggested herein, may be made within the spirit and scope of this invention. I claim:

1. A method of separating a salable coal product from a solid material containing coal therein comprising the steps of introducing a pre-crushed and pre-screened quantity of said solid material of particle size 1 1/4 x 0 inch into a mixing zone located centrally within a mixing chamber, said mixing zone being open at the top and the bottom and communicating at said bottom with said mixing chamber, introducing a first stream of water downwardly and centrally into said mixing zone at about 65 p.s.i. to create a condition of turbulence within said zone and within said mixing chamber, introducing a second stream of water into said mixing chamber at about 2 to 5 p.s.i. under substantially quiescent conditions and adjacent the bottom of said mixing chamber, withdrawing a stream of a solids-water mixture from the bottom of said mixing chamber, introducing said solids-water mixture tangentially into a cyclone separator at about 4 to 6 p.s.i., said cyclone separator having inner and outer vortex established by the tangential introduction of said solids-water mixture passing the tangentially moving solids-water mixture downwardly from the outer vortex into contact with a first conical member located above the bottom of said cyclone separator and adjacent the outer surface thereof, said first conical member having a cone angle of generation approximately equal to 68°, passing the tangentially moving solids-water mixture further downwardly into contact with a second conical member extending from said first conical member to the bottom of said cyclone separator and having a cone angle of generation approximately equal to 53°, passing the tangentially moving solids-water mixture still further downwardly into contact with a third conical member located below said bottom of said cyclone separator and having an upper opening of substantially the same size and mating with an opening provided at the bottom of said second conical member, said third conical member having a cone angle of generation approximately equal to 7°, withdrawing a solids-water mixture from the top of said inner vortex and treating the mixture to remove water therefrom and to recover a solid coal product, withdrawing a solids-water mixture from the bottom of said cyclone separator below said third conical member and treating the mixture to remove water therefrom and to obtain a refuse, and recycling the water removed from said mixtures.

2. A method of separating a salable coal product from a solid material containing coal as set forth in claim 1 which includes the step of feeding a portion of the solids-water mixture withdrawn from the bottom of said mixing chamber to a second cyclone separator at about 4 to 6 p.s.i., said second cyclone separator being fed in parallel with said first-mentioned cyclone separator and operating in substantially the same manner as said first cyclone separator.

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3. A method of separating a salable coal product from a solid material containing coal therein as set forth in claim 1 wherein said solids are introduced into said mixing zone at a rate of about 1.3 to 1.7 pounds per gallon of total water introduced into said mixing chamber and mixing zone.

4. Apparatus for separating a salable coal product from a solid material containing coal therein comprising a mixing chamber, means establishing a mixing zone located centrally within said mixing chamber, said mixing zone being open at the top and the bottom and communicating at said bottom with said mixing chamber, means for introducing a precrushed and pre-screened quantity of said solid material of particle size  $1\frac{1}{2} \times 0$  inches into said mixing zone, means for introducing a first stream of water downwardly and centrally into said mixing zone to create a condition of turbulence within said zone and within said mixing chamber, means for introducing a second stream of water into said mixing chamber under substantially quiescent conditions and adjacent the bottom of said mixing chamber, means for withdrawing a stream of solids-water mixture from the bottom of said mixing chamber, a cyclone separator, means for introducing said solids-water mixture tangentially into said cyclone separator, a vortex finder supported centrally within said cyclone separator, said vortex finder having a diameter equal to about  $1\frac{1}{2}$  the diameter of said solids-liquid stream and having a lower opening located within said cyclone separator at a point spaced from the bottom thereof about equal to the diameter of said solids-liquid stream, said vortex finder having an upper end extending upwardly above the top of said cyclone separator, a first conical member located above the bottom of said cyclone separator and adjacent the outer surface thereof, said first conical member having a cone angle of generation approximately equal to  $68^\circ$ , a second conical member extending from said first conical member to said bottom of said cyclone separator and having a cone angle of generation approximately equal to  $53^\circ$ , a third conical member below said bottom of said cyclone separator and having an upper opening of substantially the same size and mating with an opening provided at the bottom of said second conical member, said third conical member having a cone angle of generation approximately equal to  $7^\circ$ , means for withdrawing a solids-water mixture from the upper end of said vortex finder and for treating the mixture to remove water therefrom and recover a solid coal product, means for withdrawing a solids-water mixture from the bottom of said cyclone separator and for treating the mixture to remove water therefrom and to obtain a refuse, and means for recycling the water removed from said mixtures.

5. Apparatus for separating a salable coal product from a solid material containing coal as set forth in claim 4 including a second cyclone separator, means for introducing a portion of the solids-water mixture withdrawn from the bottom of said mixing chamber to said second cyclone separator at about, said second cyclone separator being operated in parallel with said first-mentioned cyclone separator, said second cyclone separator having the same internal components and dimensions as set forth above with respect to said first cyclone separator.

6. Apparatus for separating a salable coal product from a solid material containing coal therein comprising a mixing tank closed at the bottom and open at the top, a hollow cylinder suspended in said tank and lo-

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cated substantially centrally therein, said cylinder being open at the top and the bottom, said cylinder having an internal horizontal cross sectional area equal to about one-quarter of the internal horizontal cross sectional area of said tank, a vertical inlet pipe having a diameter of approximately one-sixth of the diameter of said cylinder extending downwardly into said cylinder, the bottom end of said pipe extending below the upper end of said cylinder, a flat conical baffle suspended below the lower open end of said pipe with its conical surface arranged divergently downwardly, the side of said conical baffle being located below said open end of said pipe approximately one-twelfth of the diameter of said pipe, a second pipe communicating with the lower end of said tank radially with respect to the center of said cylinder, said second pipe having a flow diverter at the end thereof and within said tank, said second pipe being substantially of the same diameter as said first pipe, said flow diverter having an opening within said tank, the height of said opening being about one-quarter of the diameter of said second pipe and the horizontal length of said opening being equal to about three times the diameter of said pipe, a third pipe connected to said tank at the bottom thereof opposite from said second pipe and being of substantially the same diameter as said first and second pipes, a first pump for introducing water into said tank through said first pipe at about 65 p.s.i. to create a condition of turbulence within said cylinder and within said tank, a second pump for introducing water into said tank through said second pipe at about 2 to 5 p.s.i. under substantially quiescent conditions, means for introducing a quantity of precrushed and pre-screened solid material of particle size  $1\frac{1}{2} \times 0$  inches at a rate equal to about 1.3 to 1.7 pounds of solid per gallon of water of the total water introduced into said tank, a cyclone separator having a vertical cylindrical outer casing whose inner diameter is substantially equal to its height, said cylindrical casing being substantially closed at the top and bottom thereof, a fourth pipe leading tangentially into said cylindrical casing adjacent the top thereof, the diameter of said fourth pipe being substantially the same as the diameter of said first pipe, the internal diameter of said cylindrical casing being slightly in excess of three times the diameter of said first pipe, a third pump having its inlet connected to said third pipe and its outlet to said fourth pipe for introducing a solids-water mixture into said cyclone separator at about 4 to 6 p.s.i. and at a rate equal to the rate of introduction of total water into said mixing tank, a vortex finder concentrically located within said cylindrical casing of said cyclone separator, said vortex finder having a lower opening located within said cyclone separator at a point spaced from the bottom thereof about equal to the diameter of said first pipe, the internal diameter of said vortex finder being equal to about  $1\frac{1}{2}$  the diameter of said first pipe, the upper end of said vortex finder extending upwardly above the top of said cylindrical casing, means providing a seal between the side edge of said vortex finder and the upper end of said cylindrical casing, means for providing vertical adjustment of said vortex finder, a flat plate at the bottom of said cylindrical casing of said cyclone separator, an opening centrally located in said bottom of said casing substantially equal in diameter to the diameter of said vortex finder, a compound conical dish resting on said bottom of said casing and having a lower opening substantially equal to and mating with the opening in said bottom, said

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compound conical dish being formed of two conical surfaces, the first of which extends from adjacent the internal surface of said cylindrical casing to a circular line of intersection intermediate the internal surface of said casing and said opening in said bottom and having a cone angle of generation approximately equal to  $68^\circ$ , said conical dish also having a second conical surface extending from said circular line of intersection to said bottom opening and having a conical angle of generation approximately equal to  $53^\circ$ , a nozzle connected below said bottom of said cyclone separator and having an upper opening of substantially the same size and mating with the opening in said bottom, the lower end of said nozzle terminating in an opening having a diameter slightly greater than one-half of the diameter of said first pipe, said nozzle having an internal conical surface extending from the upper opening of said nozzle to the lower opening thereof at a cone angle of generation approximately equal to  $7^\circ$ , the vertical height of said nozzle being slightly in excess of one-half of the diameter of said cylindrical casing, means for treating the effluent solids-water mixture issuing from the top of said vortex finder to remove water therefrom and recover a solid coal product, means for treating the solids-water effluent from the nozzle at the bottom of said cyclone separator for removing water therefrom and refuse, and means for recycling the water from said refuse and said product treating means.

7. Apparatus for separating a salable coal product from a solid material containing coal therein comprising a mixing tank closed at the bottom and open at the top, a hollow cylinder suspended in said tank and located substantially centrally therein, said cylinder having an internal horizontal cross sectional area equal to about one-quarter of the internal horizontal cross sectional area of said tank, a vertical inlet pipe having a diameter of approximately one-sixth of the diameter of said cylinder extending downwardly into said cylinder, the bottom end of said pipe extending below the upper end of said cylinder, a flat conical baffle suspended below the lower open end of said pipe with its conical surface arranged divergently downwardly, the side of said conical baffle being located below said open end of said pipe approximately one-twelfth of the diameter of said pipe, a second pipe communicating with the lower end of said tank radially with respect to the center of said cylinder, said second pipe having a flow diverter at the end thereof and within said tank, said second pipe being substantially of the same diameter as said first pipe, said flow diverter having an opening with said tank, the height of said opening being about one-quarter of the diameter of said second pipe and the horizontal length of said opening being equal to about three times the diameter of said pipe, a third pipe connected to said tank at the bottom thereof opposite from said second pipe and being of substantially the same diameter as said first and second pipes, a first pump for introducing water into said tank through said first pipe to create a condition of turbulence within said cylinder and within said tank, a second pump for introducing water into said tank through said second pipe under substantially quiescent conditions, means for introducing a quantity of precrushed and pre-screened solid material of particle size  $1\frac{1}{4} \times 0$  inches into the upper end of said cylinder, a cyclone separator having a vertical cylindrical outer casing, a fourth pipe leading tangentially into said cylindrical casing adjacent the top

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thereof, the diameter of said fourth pipe substantially the same as the diameter of said first pipe, the internal diameter of said cylindrical casing being in excess of three times the diameter of said first pipe, a third pump having its inlet connected to said third pipe and its outlet to said fourth pipe for introducing a solids-water mixture into said cyclone separator, means for discharging a solids-water mixture from the top of said cyclone separator, means for discharging a solids-water mixture from the bottom of said cyclone separator, means for treating the solids-water mixture issuing from the top of said cyclone separator to remove water therefrom and recover a solid coal product, means for treating the solids-water mixture issuing from the bottom of said cyclone separator for removing water therefrom and refuse.

8. Apparatus for separating a salable coal product from a solid material containing coal therein comprising a mixing tank closed at the bottom and open at the top, a hollow cylinder suspended in said tank and located substantially centrally therein, said cylinder being open at the top and the bottom, said cylinder having an internal horizontal cross sectional area equal to about one-quarter of the internal horizontal cross sectional area of said tank, a vertical inlet pipe having a diameter of approximately one-sixth of the diameter of said cylinder extending downwardly into said cylinder, the bottom end of said pipe extending below the upper end of said cylinder, a flat conical baffle suspended below the lower open end of said pipe with its conical surface arranged divergently downwardly, the side of said conical baffle being located below said open end of said pipe approximately one-twelfth of the diameter of said pipe, a second pipe communicating with the lower end of said tank radially with respect to the center of said cylinder, said second pipe having a flow diverter at the end thereof and within said tank, said second pipe being substantially of the same diameter as said first pipe, said flow diverter having an opening within said tank, the height of said opening being about one-quarter of the diameter of said second pipe and the horizontal length of said opening being equal to about three times the diameter of said pipe, a third pipe connected to said tank at the bottom thereof opposite from said second pipe and being of substantially the same diameter as said first and second pipes, a first pump for introducing water into said tank through said first pipe to create a condition of turbulence within said cylinder and within said tank, a second pump for introducing water into said tank through said second pipe under substantially quiescent conditions, means for introducing a quantity of precrushed and pre-screened solid material of particle size  $1\frac{1}{4} \times 0$  inches into the upper end of said cylinder, a cyclone separator having a vertical cylindrical outer casing whose inner diameter is substantially equal to its height, said cylindrical casing being substantially closed at the top and bottom thereof, a fourth pipe leading tangentially into said cylinder adjacent the top thereof, the diameter of said fourth pipe being substantially the same as the diameter of said first pipe, the internal diameter of said cylindrical casing being slightly in excess of three times the diameter of said first pipe, a third pump having its inlet connected to said third pipe and its outlet to said fourth pipe for introducing a solids-water mixture from said mixing tank into said cyclone separator, a vortex finder concentrically located within said cylindrical casing of said cyclone separator, said vortex finder hav-

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ing a lower opening located within said cyclone separator at a point spaced from the bottom thereof about equal to the diameter of said first pipe, the internal diameter of said vortex finder being equal to about  $1\frac{1}{2}$  of the diameter of said first pipe, the upper end of said vortex finder extending upwardly above the top of said cylindrical casing, means for providing a seal between the side edge of said vortex finder and the upper end of said cylindrical casing, means for providing vertical adjustment of said vortex finder, a flat plate at the bottom of said cylindrical casing of said cyclone separator, an opening centrally located in said bottom of said casing substantially equal in diameter to the diameter of said vortex finder, a compound conical dish resting on said bottom of said casing and having a lower opening substantially equal to and mating with said opening in said bottom, said compound conical dish being formed of two conical surfaces, the first of which extends from adjacent the internal surface of said cylindrical casing to a circular line of intersection intermediate the internal surface of said casing and said opening in said bottom and having a cone angle of generation approximately equal to  $68^\circ$ , said conical dish also having a sec-

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ond conical surface extending from said circular line of intersection to said bottom opening and having a conical angle of generation approximately equal to  $53^\circ$ , a nozzle connected below said bottom of said cyclone separator and having an upper opening of substantially the same size and mating with the opening in said bottom, the lower end of said nozzle terminating in an opening having a diameter slightly greater than one-half of the diameter of said first pipe, said nozzle having an internal conical surface extending from the upper opening of said nozzle to the lower opening thereof at a cone angle of generation approximately equal to  $7^\circ$ , the vertical height of said nozzle being slightly in excess of one-half of the diameter of said cylindrical casing, means for treating the effluent solids-water mixture issuing from the top of said vortex finder to remove water therefrom and recover a solid coal product, means for treating the solids-water effluent from the nozzle at the bottom of said cyclone separator for removing water therefrom and refuse, and means for recycling the water from said refuse and said product treating means.

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